MISCELLANEOUS OBSERVATIONS, TOGETHER WITH A COLLECTION OF...

B. RACKSTROW, Sir William WATSON

cellaneous OBSERVATIONS,

Together with a COLLECTION of

XPERIMENTS

ON

LECTRICITY.

WITH THE

NER of PERFORMING them.

ied to Explain the NATURE and CAUSE
he moſt remarkable *Phænomena* thereof:

WITH

E REMARKS on a Pamphlet, intituled,
equel to the Experiments and Obſervations
ng to illuſtrate the Nature and Properties
lectricity.

To which is annexed,

TTER, written by the Author to the *Aca-*
of Sciences at *Bourdeaux*, relative to the
larity of *Electricity* to *Lightening* and
der.

By B. RACKSTROW. K

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PREFACE.

THE reaſon that induc'd me to trouble the town with my thoughts upon ſo intricate a ſubject, was, my not being proof againſt flattery; which is a misfortune attending ſome others, as well as myſelf: and, as I ſhew'd the experiments in public, I took pains to conſider of a plauſible ſolution of each; and ſeveral gentlemen of diſtinction and capacity ſeeming pleaſed with the manner of my accounting for ſome of them, adviſed me to make a ſyllabus of the experiments which I exhibited, and write my ſentiments upon them: and obſerving two ſets of gentlemen of different opinions; the one, that would have all the Electricity to be attracted from the Floor, and none from the Air; the other ſet would allow none of the Electrical Fire to come from the Non-electric, I thought I could prove by experiments, that great part came from the Air, and that part is to be attracted from the Non-electric: ſo my thoughts led me to be as *a Mediator between theſe gentlemen, which I hope will give no offence: beſides, it might be politic in me to be between; for I was told of an old* Latin *phraſe, which, being* Engliſhed, *implies, that the Midway is ſafeſt; and poſſibly one ſide may be more in the wrong than I.*

I have had great encouragement ſince I began to ſhew the Electrical Experiments. Our gallant and illuſtrious Prince the Duke of Cumberland *has honour'd me ſeveral times; and the laſt time I was farther honour'd by him, in bringing with him the Princeſſes* Amelia *and* Heſſe. *I have had the greateſt part of the Nobility of this Kingdom, Ambaſſadors, and principal Foreigners. I have been very much oblig'd by the gentlemen of the* Royal Society, *in doing me the honour of ſeeing my performances; but more eſpecially thoſe Experiments which I found out myſelf; but particularly by their worthy* Preſident, *at ſeveral times, who was always ſo kind as to bring company with him, among whom were ſome of great diſtinction; I ſay, the encouragement I met with, and ſome gentlemen telling me I ſhould be much to blame, if I did not write ſomething in the manner I have attempted in this pamphlet: but I fear it has made me act as the Crow in the Fable, when perſuaded to ſing.*

Thus loſing a good deal of time, and knowing myſelf not qualified for an Author, I am almoſt ſatisfied, that, inſtead of a Philoſopher, I am publiſhing myſelf to be of the family of the Wrongheads; and while I was writing this book, could have made the reſemblance of ſeveral Right-Heads, and by that means would have put money in my pocket.

I had a great mind to have ask'd the Duke of Cumberland *the favour of his ſitting to me for his Buſt. Numbers of all diſtinctions would have been glad to have a Buſt of the Duke in the manner I make them from the life: there they would ſee a perfect Likeneſs; it being the ſureſt and trueſt way of preſerving one. This would have been of the greateſt honour and ſervice to me imaginable.*

But, methinks, I hear one ſay, What is this Fellow at? Is this a Preface? *No! 'tis an* Advertiſement! *He is puffing about his Company; and tells us of his Buſineſs, inſtead of ſaying ſomething of his Book. I own I am not uſed to write: read the Book; and if it has not a much better reception from the public than I expect, I will ſincerely promiſe never to ſcribble again.*

I wrote a great part of this treatiſe two years ago; but now obſerving that thoſe gentlemen who contradicted me (when I aſſerted the Electricity to paſs through the Pores of bodies) and at that time would have it to be only as a Capſula to the Body Electrified, are now not only come into my ſentiments, but endeavour to make the world believe, that they have found out, by experiment, that it does paſs through the Pores of all Bodies more or leſs; which is only proving what I *did almoſt three years ago, by my experiment* in vacuo; *which I ſhew'd in public, and even to thoſe very gentlemen I now ſpeak of, and particularly in the Beatifying Experiment.*

However ſuperficially I have handled the foregoing ſubject, I hope it will be excuſed, when I aſſure my reader, the remaining pages are written with all the Care and Exactneſs that my Capacity would admit of.

MIS-

Miſcellaneous OBSERVATIONS

ON

ELECTRICITY.

NUMBERS of learned men agree, that whatever *effluvia* the earth affords impregnate the air; and that theſe are kept aſunder by pure Æther: but to ſpeak as an operator in Electricity, thoſe *effluvia*, becoming ſaturated with electrical fire, repel each other. Sir *Iſaac Newton* obſerves, that the particles of vapours, exhalation and air, do ſtand at a diſtance from one another, and endeavour to recede as far from one another as the preſſure of the incumbent Atmoſphere will let them: for he conceives the confuſed maſs, vapours, air, and exhalations, which we call the Atmoſphere, to be nothing elſe but the particles of all ſorts of bodies of which the earth conſiſts, ſeparated from one another, and kept at a diſtance by the ſaid principle.

Philoſophers both antient and modern mention the air's being made fluid by fire. Several ingenious gentlemen deny air to be a diſtinct Element, but aſſert it to be a maſs of particles the moſt oppoſite in their natures to each other, becoming air only by acquiring Elaſticity and Volatility from the attraction of ſome ſubtil ſubſtance, which I take to be the ſame as our electrical fire, that being endued with the properties of attraction, repulſion, and expanſion: it is the moſt ſubtil and elaſtic of all bodies, and ſeems to pervade and expand itſelf throughout the Univerſe; it is the firſt moving Agent in matter, and that from whence the air derives its ſpring; it is equally fitted to nouriſh and deſtroy, and is every-where ready at hand to break forth into action, being always reſtleſs, and very rapid in its motion, penetrating in its nature, and extenſive in its effects; which the many ſurpriſing experiments we daily make fully prove, as well as thoſe amazing effects it has upon animal bodies. And if we do but conſider the great diſcoveries and improvements made therein within theſe three years, we muſt expect, that, by a due application to theſe experiments, ſome things may turn out very beneficial to mankind, both as to mental improvement and corporeal benefit.

The circulation is increaſed by a perſon's ſtanding only upon a cake of reſin, and ſo electrified; and the effects are ſo moderate, that they only ſerve to chear and raiſe the animal ſpirits; for when it acts the ſtrongeſt, it will increaſe the number of pulſes three or four in half a minute, and when weak, about two; and even that, as I apprehend, may prove of very great ſervice; but what tends to the greateſt good, are the ſhocks given moderately, and with ſome judgment; and I am well aſſured, that it will remove many obſtructions, and be of great uſe in paralytic caſes; it helps digeſtion, quickens the circulation of the blood, provokes urine, and cauſes a freer reſpiration and perſpiration. All theſe I have often obſerved, and doubt not but that many other things beneficial to man may farther be diſcover'd; ſuch as may help in colic, iliac pains, ſpaſms, convulſions, apoplexies, hyſteric, rheumatic, and arthritic diſorders, *&c.*

It is a pity, that ſome concerned in ſhewing theſe experiments, and writing upon them, ſhould endeavour to intimidate people from going through them; one by playing tricks to ſtartle, and another by writing ſomething terrible of death and deſtruction.

Since it is certain, from the ſimilarity between gunpowder and thunder, *&c.* that ſeveral operations in Chemiſtry have an analogy to the *phænomena* of Electricity, if therefore I ſhould attempt to explain the one by way of analyſis from the other, in the following pages, however imperfectly, I hope the candid will indulge me a hearing.

Acid, ſaith *Homberg*, is never found alone, but always joined with ſulphur, which determines it to this or that ſpecies producing different ſalts. Salts, according to Sir *Iſaac Newton*, are dry earth and watry acid united by attraction, the acid rendering them ſoluble in water. He ſuppoſes the watry acid to flow round the terreſtrial part as the ocean doth round the earth, being attracted thereby. Whatever attracts, and is attracted moſt ſtrongly, is an acid in his ſenſe; and our electrical flame has both the ſmell and taſte of an acid.

Salts

Salts are vulgarly reckoned the moſt active of the Chemical principles; but *Homberg* derives all their activity from the ſulphur joined with them.

Whatever is aſcribed to acid may be aſcribed to fire, or *æther*. The particles of *æther* fly aſunder with the greateſt force; and, agreeable to Sir *Iſaac Newton*'s doctrine, when united, they muſt attract each other with the greateſt force; therefore they conſtitute the acid; for whatſoever ſtrongly attracts, and is attracted, may be called an acid, as Sir *Iſaac Newton* informs us in his tract *de acido*. Hence it ſhould ſeem that the ſulphur of *Homberg* and the acid of Sir *Iſaac Newton* are at bottom one and the ſame thing; *viz.* pure æther or electrical fire.

Fire incloſed will attract fire. If we conſider both natural and artificial glaſs, it is evident in the natural, ſuch as the diamond, chryſtal, *Scotch*, and *Brazil* pebble; all which have their attractive and repelling power upon friction. Glaſs artificial is a compoſition of lead and ſalt of the fixed kind, as ſalt-petre, ſuch as will not evaporate with the moſt intenſe heat, ſand or ſtone that will melt eaſily, which gives firmneſs and conſiſtence to the glaſs. The ſtone made uſe of ſhould be white and tranſparent, and ſtrike fire with ſteel. Hence it plainly appears there is fire in the compoſition; and I can't help thinking but that it muſt imbibe a great deal in paſſing through that violent heat, as is evident in making red lead, in calcining antimony and ſalt of tartar, where a greater weight comes out than was put into the fire; wherefore the red lead, *&c.* ſhould ſeem impregnated with fire.

In ſpirits of nitre you will find the ignited bodies always in motion; witneſs the fume when the ſtopple is pulled out: As for the flint made uſe of, it carries fire in it.

From lead are made various compoſitions, which contain both ſalt and ſulphur. Hence may be gather'd that the principal compoſition of glaſs is fire.

It is certain that the *apparatus* is concerned in a more particular manner than the grinding of the air between the glaſs and hands, or cuſhion; for if you lay a glaſs tube in the ſun, it will acquire the power of attracting and repelling. There can be no grinding of the air in this experiment; it is only the motion which the ſun puts the glaſs into that makes it attract the lambent flame; and thoſe ſubtil particles which are in the glaſs, being put into motion by the very ſwift revolutions of the glaſs globe and attrition of the hands at the ſame time, we may as well ſuppoſe the air to be whirl'd round the ſphere as water round the grind-ſtone; and if we will allow, that fire incloſed, put into motion, will attract fire, it is but reaſonable to think, that when the fiery particles which are in glaſs are excited by attrition, they will attract and ſet at liberty the æthereal fire from thoſe groſs and heterogeneous particles that clogg'd and reſtrain'd it from its natural activity; but once let looſe, it ſwiftly flies through all metals, vegetables, and animals that come into contact, and are ſuſpended by ſilk lines, or ſtand upon ſuch bodies as have a power of attracting and repelling, ſuch as glaſs, amber, wax, reſin, &c. when excited by friction, before it mixes with the univerſal æther; and as it paſſeth through the before-mentioned bodies, it has the power of attracting and repelling all light bodies, and of attracting fire out of the animal body; and it is reaſonable to think, that thoſe bodies that are become electrified have the power of attracting the particles of Æther, as well as the excited globe; and we obſerve accordingly, that the lambent flame flies through all theſe bodies almoſt inſtantaneouſly; *viz.* the wires, gun-barrel, *&c.* and the particles of æther, having the power of attracting, bring along with them in their progreſſion all light bodies; but when thoſe light bodies touch the body electrified, they become ſaturated and repell'd with force, by the freſh influx of Æther.

It is allowed, that bodies electrified form to themſelves an Atmoſphere, which corroborates what I have ſaid; for, ſuppoſe a copper globe electrified, it will attract in all directions the particles of Æther that are within a certain diſtance: all theſe particles have a tendency towards the centre of the copper globe, and in their progreſſion bring along with them all ſuch light bodies as they meet within their ſphere of action, ſuch as thiſtle-down, *&c.*; but theſe light bodies no ſooner touch the electrified copper globe than they become fill'd with Æther, and form an Atmoſphere to themſelves, whoſe centre of motion being different from that of the globe, and being the lighter bodies (and by force of the freſh quantity of electrical fire darting into the thiſtle-down, continually ruſhing from the excited glaſs globe), they are repell'd, and kept out of the ſphere of action of the copper globe, or other bodies electrified, their pulſes being in different directions; but if we were not to ſend a freſh quantity of Æther they would not be repell'd, for the action would ceaſe.

It is obſerv'd, that urine produceth no phoſphorus till it be long expoſed to the air; from all which we may conclude, that bodies attract and fix the light..

That light or fire which is attracted and fixed by the urine being expoſed to the air, muſt be what we call electrical fire, or pure Æther; for both phoſphorus and Electricity have the peculiar property of appearing much more luminous *in vacuo* than where the culinary fire can ſubſiſt.

Both new and old bays attract this fire; and it has often been obſerved in a froſty night, that the bays ſhall look luminous, and at the approach of a finger to it that the electrical ſtroke ſhall be felt.

Fire or light mixeth with all bodies, even with water; witneſs the flaſhing lights in the ſea, whoſe waves ſeem frequently all on fire, as do thoſe luminous exhalations from putrified waters called *ignes fatui*.

The experiment of the phial of water is an immediate and ſubſtantial proof of this; and farther evinceth what the biſhop of *Cloyne* ſaith, that Æther, fire, or ſpirit, being attracted and clogg'd by heterogeneous particles, become leſs active; and I have kept a phial of water almoſt ten hours, which I had electrified before it had loſt its electricity.

And again, the heterogeneous particles cohering with thoſe of æther become more active; witneſs the water from the capillary ſyphon, which, from mere dropping, is forced to run a full ſtream when electrified.

This alſo proves the repelling force, by the freſh quantity of Æther ruſhing on; for it is to be obſerved that the Electricity ſwiftly paſſes away from the end of a ſmall wire, in diverging rays repreſenting a lambent flame, and ſo from the end of the ſmall ſyphon the electrical flame works off, and ſwiftly moves the water along with it.

In Dr. *Deſaguliers*'s courſe of experimental philoſophy, he aſſerts air to have the following properties, on which I have made the enſuing remarks; *viz.*

'That air is a fluid, conſiſting of parts that 'drive each other from their reſpective centres; 'becauſe it has been found by experiments, that 'its denſity is equal to its compreſſion; and Sir '*Iſaac Newton* has demonſtrated ſuch a fluid muſt 'conſiſt of parts that have a centrifugal force.'

I imagine the air or atmoſphere to be the *effluvia* of the earth ſaturated with electrical fire, which cauſes thoſe *effluvia* to repel each other, and expand every way, and to be of ſuch an elaſtic force as to cauſe their denſity to be equal to their compreſſion.

'That air near the earth is in a compreſs'd 'ſtate, by reaſon of the great weight of the air 'above it: the atmoſphere is no higher ſenſibly 'than about 45 miles, as is ſhewn by conſidering 'how high the mercury muſt ſtand in the barometer at different heights above the ſurface of 'the earth.'

By this it appears to me, that the fartheſt that the *effluvia* of the earth are attracted from the ſurface thereof is not above 45 miles; and theſe *effluvia*, being acted upon by the electrical fire, are repell'd and kept at a diſtance every way from each other; and that it is theſe *effluvia* that preſs againſt all terreſtrial bodies, which is what we call the preſſure of the air or Atmoſphere. For the electrical fire, or pure Æther, could not have that effect alone; the particles, being ſo very ſubtil, would paſs through the pores of moſt bodies: and the reaſon that we have no preſſure from that which is above 45 miles from the ſurface of the earth, is, that it is pure Æther, of ſo ſubtil a nature, as to paſs through the pores of bodies, and not to preſs upon thoſe bodies.

'The air always endeavours to continue of the
'ſame tenour: if it be condenſed or rarefied in
'one place, when left to itſelf, it will return to its
'former denſity. Upon this principle are artificial
'fountains fill'd and play'd.'

Let us ſuppoſe air to be condenſed in the barrel of a wind-gun; if then the *effluvia* of the earth, cohering with Æther, be what we call the air, and if to Æther air owes its ſpring, and if ſuch Æther be of ſo very ſubtil a nature, why does it not paſs through the pores of the barrel; and by that means the air that was condenſed in the barrel loſe its ſpring? I anſwer;

There being no more Æther than enough to ſaturate the *effluvia*, I believe it would not fly off from the *effluvia*; but if it were poſſible to ſet it at liberty in the *vacuum*, it would expand itſelf and *effluvia* to a ſurpriſing circumference.

In the experiment of a tight-blown bladder being put upon an air-pump under a receiver, and the air exhauſted ſo as to take off the preſſure of the air from the bladder, the Æther does not paſs through the pores of the bladder, and leave the *effluvia* behind, but cauſes the *effluvia* to expand, and burſt the bladder with a loud report. The ſame may be done with a ſquare glaſs bottle. But when Æther is ſeparated from all ſuch heterogeneous particles as can reſtrain it, as we ſeparate it when we ſhew the electrical experiments, the Æther paſſes through the pores of the bladder, as it does through the pores of all metals.

But the preſſure of the Atmoſphere (being of the ſame quality with that which is condenſed in the gun-barrel or bladder) keeps up the equilibrium, as the air in the body enables us to bear the preſſure of the Atmoſphere, and has the power to repel or prevent the electrical fire or Æther paſſing through the pores of the barrel or bladder, and by that means preſerves the ſpring to the air withinſide of them.

Air is therefore a maſs of various particles, abraded and ſublimated from wet and dry bodies of all ſorts, cohering with the particles of Æther. But Æther being ſeparated from thoſe heterogeneous particles becomes exceedingly more active. I have, by endeavouring to ſeparate them, become ſo ſtrongly electrified, that I have emitted fire that has been both ſenſibly felt and ſeen, without my ſtanding upon any electrical bodies, but only upon the bare boards, and even without ſhoes.

The method I made uſe of to ſeparate the electrical fire from the particles thatclogg'd it will be deſcribed in the experiment of the Chair. But as to pure Æther, or electrical fire, the excited globe attracts the greater part, if not all, from the air. I need not except what is attracted from the non-electric by the *Apparatus* when electrified; the non-electric recovering its freſh ſupply from the air: for when we have an intenſe watry Atmoſphere, and the preſſure of air the leaſt, we can get but very little Electricity; but in a fine clear day, when the preſſure of the air is greateſt, we get the greateſt quantity of electrical fire.

Query. If this fire was attracted from the floor, as Mr. *Watſon* ſuppoſes, why ſhould we get the moſt Electricity when the preſſure of the air is greateſt, as it is in the fineſt days? One might naturally think that the great preſſure would tend to keep it within the earth; and if it is attracted from the floor only, what need we mind the ſtate of the air, or whether our ſupporters are non-electric or not?

It may be obſerved in the experiment of the Feather, that when the globe begins to turn to electrify, the plumes of the feather are firſt attracted downwards; which ſhews that the ſtand the Feather is placed upon, as it becomes electrified, has the power of attracting the particles of Æther that are in the air; which particles bring down the fibres of the Feather, as they are attracted towards the ſtand; ſo the Feather ſeems to ſhrink before it is electrified, as it does when a non-electric touches any part of the wire that is in contact with the Feather when electrified; but when the ſtand becomes ſaturated, and forms an Atmoſphere of electrical *effluvia* itſelf, thoſe *effluvia*, by getting between all the ſmall fibres of the Feather, cauſe them to expand, and their points to be kept at a diſtance as far as poſſible, as they do in all bodies that float in air.

Before I ſhew'd the electrical experiments in public, I ſet my machine, and the man that turn'd the wheel, upon reſin, to collect much more of the Electricity, but found myſelf deceived: I therefore concluded immediately, that as one magnet would not attract another, but a piece of ſteel being within a proper diſtance of a loadſtone, the attraction would be immediately perceivable, ſo two Electrified Bodies do not attract each other, but endeavour to recede from one another as far as they can. Therefore I was not ſurpriſed when I made theſe and ſome other reflections, that the machine, when ſet upon reſin, and the men that work'd it, ſhould loſe the power of collecting the Electricity: for we may conſider them as in air, ſo the gun-barrel, wires, &c. the ſame; the reſin or ſilk not allowing the electrical fire to paſs thro' them into the floor: but ſeeing that the man who holds his hands, and he that turns the wheel, and all the wood, and metallic part of the *Apparatus*, while on the floor, are non-electric; therefore they are ready to attract and convey the Electricity.

This pure Æther, Fire, or Light, the mighty Agent in the hands of our Great Creator, expands itſelf through the heavens, is always reſtleſs, and inſtantaneous in its motion; is abſorbed by the earth in one part, and flies out at another; paſſes through and pervades the pores of all bodies; and when the glaſs globe is ſtrongly excited by the attrition of the hands, and the air gather'd round the glaſs ſphere, the æthereal fire therein is attracted, looſen'd, and ſeparated thereby from the watry and earthy particles that clogg'd it, and paſſes off in a current from each hemiſphere of the excited globe, through the man that holds his hands upon the globe, from one hemiſphere; and through the gun-barrel, wires, *&c.* from the other; which being properly ſuſpended by ſilk lines, clog and reſtrain the Electricity from its natural activity; which we are ſenſible of upon the approach of a finger: we may ſee the fire, and feel the ſtroke; but tho' it paſſes through the man that holds his hands upon the globe to excite it, as he ſtands upon the ground, he is neither ſenſible of it, nor thoſe who attempt to touch him: but if he ſtands upon reſin, he becomes ſtrongly electrified; tho' if a non-electric takes hold of the man that ſtands upon the reſin, and is electrified, he immediately loſes his Electricity, it is attracted by the non-electric from him; which inſtantaneouſly paſſes through, and is abſorbed by the earth.

While this is tranſacting on one ſide of the globe, let a non-electric take hold of the gun-barrel, or the wires that convey the Electricity, on the other ſide, and all on that ſide will loſe the Electricity that inſtant, it paſſing through them that take hold into the floor. Now the Electricity being taken off on both ſides, let a third perſon hold the wire of the phial of water againſt the globe, and it will electrify it. (All the while the globe muſt be kept in motion, and the man hold his hands upon it.)

I can no-ways conceive how the very thing that takes away the Electricity, ſhould convey it to the globe to electrify water: I ſhould rather think, ſince the men and the *Apparatus*, *viz.* the wood and metallic part, are non-electric while ſtanding upon the ground, that they would aſſiſt in attracting and letting looſe the electrical fire from the air; one part of which immediately ruſhes through the man that holds his hands upon the globe into the floor; whilſt the other part paſſes through the gun-barrel, wires, *&c.* but not ſo inſtantaneouſly; for which reaſon it aſſiſts us in ſhewing the experiments.

The gun-barrel, wires, *&c.* when electrified, have the power of attracting the æthereal particles that are in the air; thoſe particles attracted are in moſt of them in different directions to thoſe which came from the glaſs globe, and electrified the gun-barrel, *&c.* the continual efflux of electrical Æther from the excited glaſs globe, acting ſtronger than thoſe particles that are in air, as it ruſhes through the electrified bodies, is that which makes it neceſſary for a non-electric to be held nigh the gold or ſilver Leaf, in its ſuſpenſion, to take off the Electricity as faſt as the upper plate electrifies it; it is this that keeps the æquilibrium; and the repulſion the Electricity meets with in the gun-barrel from thoſe particles in the air, confines it longer to thoſe bodies we call Electrified, than to thoſe through which the current of Æther paſſes into the floor; the particles being in one direction makes the motion inſtantaneous. We firſt by motion ſet at liberty this electrical fire from the particles that clogg'd it, and afterwards ſtrive to reſtrain it from its activity, that we may make uſe of it to ſhew theſe ſurpriſing experiments.

Mr. *Watſon* (in p. 59. of his Sequel to the Experiments) in giving a ſolution of the ſuſpenſion of the ſilver leaf, ſays,

‘ 1. That the blaſt of electrical Æther from the ‘ excited plate blows the ſilver towards the plate ‘ unexcited: this laſt, in its turn, by the blaſt of ‘ electrical Æther from the floor ſetting through ‘ it, drives the ſilver towards the plate electrified.’

As to the blaſt of electrical Æther, it would repel the ſilver, if it was not for the non-electric attracting the Electricity from the ſilver as faſt as the excited plate electrifies it: I ſay it is as a canal of communication, which diſcharges the Electricity from the excited non-electric to the unexcited one. Let any one try this experiment, by holding the back of his hand under the ſilver, inſtead of the plate, and he will feel the Electricity blowing like a cold air againſt his hand (the feeling giving us no poſitive notice of any degree of fire below the natural heat of the body, or of any ſo great as to deſtroy the organs).

It appears by this, that the Electricity is paſſing through the non-electric into the floor; and not that it comes from the floor, and ſo blows the ſilver towards the electrified plates.

When thiſtle or feather-down, &c. are attracted by a body electrified and repell’d, they never will touch an electrified body, till they have touch’d a non-electric, to which they communicate their Electricity, and ſo are made ready to be freſh attracted, but are not blown back again by the non-electric: for if a non-electric touches thiſtle-down, &c. after they have been repell’d, even at three feet diſtance from the electrified body, they will be attracted back again, though the perſon, as ſoon as he touches it, gets as far from it as he can; I rather take it that the plate electrfied has the power of attracting the particles of Æther that are in the air, and that theſe particles, having the quality of attraction alſo, bring along with them thiſtle-down, or any light body; and that the Electricity which paſſes through the ſilver, and is felt on the back of the hand of the non-electric, is the Æther that would repel the ſilver, and not that which did attract it.

‘ 2. That we find from hence likewiſe, that the ‘ draught of electrical Æther from the floor is al‘ ways in proportion to the quantity thrown by ‘ the globes over the gun-barrel.’

When we can collect the moſt Electricity by the excited globe, the moſt is attracted from the air by the body electrified as well as from the non-electric, and its action is greateſt on a clear dry day, at which time the animal body ſeems to be poſſeſſed of more electrical fire, or at leaſt is more active, and more chearful and enlivened; but contrariwiſe, on a dull day the ſpirits are heavy and oppreſs'd.

By the quantity thrown *over* the gun-barrel, I confeſs I no more underſtand him than I ſhould if he had ſaid thrown *under* the gun-barrel. I am pretty well aſſur'd, that he does not mean, that the Electricity is as a *capſula* to the gun-barrel; and if he did, he would be much in the wrong; for I can prove by experiments, that it paſſes through the pores of all bodies it electrifies.

‘ 3. He farther obſerves, that a Gentleman ‘ whoſe ſhoes were perfectly dry, and of conſe‘ quence originally-electric, and who was employed

‘ to hold the non-electric plate, through which
‘ the Æther was to come from the floor. This
‘ gentleman, he ſaid, did not furniſh a ſufficient
‘ quantity (becauſe of the drineſs of his ſhoes) to
‘ maintain the æquilibrium, and ſo the Silver was
‘ blown away.’

This gentleman, he ſuppoſes, acted the ſame as if he had ſtood upon a cake of Reſin, the ſoles of his ſhoes being thick and dry; and ſome animal ſubſtances, when dry, will not let the Electricity paſs through; whereas the truth of the matter ſeems plainly to be this; *viz.* that the perſon who holds the under plate ſtanding upon the reſin becomes electrified by the Electricity paſſing through the Leaf to him; and being fill’d, cannot take any more from the Leaf, and the ſilver becomes ſaturarated and repell’d by the under plate as well as the upper one; ſo that when the Æther comes from him that holds the plate, the Leaf is blown away, inſtead of being kept in the ſtate of ſuſpenſion. But if the perſon employ’d to hold the under plate endeavours to catch the Leaf in the plate, he may; and then, if he holds the under plate about the ſame diſtance from the upper plate, as he did when the Leaf was ſuſpended, and ſtand ſome little time in that poſture, the Electricity, which the ſilver and perſon receiv’d, that held the under plate, from the excited upper one, beginning to paſs off thro’ the emunctory pores into the Air, (for it can’t paſs through the reſin into the Floor) the Leaf will be freſh attracted, and again ſaturated and repell’d; and will act in this manner as long as you have a mind to try the experiment: therefore the Electricity that forces the Silver to the excited plate muſt come from the Air; it cannot come from the Floor, as not being able to paſs through the Reſin.

P. 60. Mr. *Watſon* further ſays : ‘ But I am able ‘ to prove the Afflux experimentally, as well as the ‘ Efflux, in the following manner : When the Sil‘ ver lies ſtill, though the motion of the globe is ‘ continued between the two plates, one ſuſpended ‘ upon the gun-barrel, and the other placed upon ‘ an electrical cake, a perſon ſtanding upon the floor, ‘ needs only bring a ſmall glaſs Syphon in a veſſel ‘ of water, and apply the long leg thereof near the ‘ plate placed upon the wax ; for upon this the ‘ Silver is immediately ſuſpended, and the water, ‘ which before only dropped, now runs in a full ‘ ſtream, and appears luminous. Does not, in this ‘ caſe, the current of the Water point out the di‘ rection of the current of electrical Æther?’

I ſay it does ; and ſhews, that it takes the Electricity from the plate, that was before electrified, and conveys it into the floor ; and not that it paſſes from the floor into the perſon that holds the water, and then through that into the plate, and ſo blows up the Leaf.

To corroborate this, try the following experiment. Let the upper ſuſpended plate, which is about ten inches diameter, be electrified, and the under plate, about 18 inches diameter, be ſet upon a cake of Reſin, at a proper diſtance from the upper one ; and let a perſon, ſtanding upon the ground, place one finger upon the under plate, and the Silver will be ſuſpended ; then try, by bringing a finger of your other hand very nigh the under plate, to ſee if it is electrified, and you will find it is not ; and this is the time at which he ſuppoſes the Electricity is blowing from the under plate to ſuſpend the Leaf : but what electrical fire it receives from the upper plate through the Silver will be inſtantaneouſly convey'd into the floor, the particles being in the ſame direction: now let the perſon take the finger off the under plate, and the Silver will be but a little while ſuſpended, but begins to be attracted and repell'd; it is collecting the Electricity from the upper plate, and conveying it to the under one, and ſeems to grow weaker and weaker, and at laſt lies at reſt upon the under plate; both the Silver and plate becoming ſaturated with Electricity, if you try with your finger you will find the plate is electrified; you may ſee the fire, and feel the ſtroke. Whilſt the Leaf continues electrified, it has the power of repelling the particles of Æther that are attracted from the air, and which would diſturb it if not electrified; but, upon the approach of the long leg of the Syphon, the water juſt at firſt is attracted in a full ſtream, tho' immediately after only it drops, and the Silver is only attracted and repell'd faintly; but, on the nigh approach of the Syphon, it will be ſuſpended.

This is no more than as if a non-electrified perſon was to put his finger on the under plate, which would take off the Electricity. I agree, that bodies electrified will attract the Electricity from the non-electrified perſon, ſo as to meet in different directions; but when the Electrified body attracts the Electricity from the Non-electric, there is no medium between, no ſilver Leaf, Feather, or Thiſtle-down, &c. The greater body will attract to itſelf the leſſer: there can be but little Electricity in the Silver; therefore it is attracted by the Non-electric; there is but little in the Feather, or Thiſtle-down, or ſuch light bodies; therefore they are attracted by the Non-electric, and convey'd into the Floor.

A perſon highly electrified, ſtanding upon Reſin, no ſooner lets one foot touch the floor, but all the Electricity is abſorbed by it. And this is agreeable to what I have aſſerted, *viz.* that the electrical Æther is expanded throughout the whole mundane ſyſtem.

P. 63, 64. he further adds: ‘ When the ma-‘ chine, *&c.* are placed upon Originally-Electrics, ‘ if a man, ſtanding likewiſe upon Originally-‘ Electrics touches the gun-barrel while the globes ‘ are in motion, he will receive a ſnap or two; ‘ after which, though the motion of the globes is ‘ continued, he will receive no more fire from the ‘ gun-barrel. While in this poſture, if he touches ‘ the wood-work of the machine with one hand, ‘ and applies a finger of his other near the gun-‘ barrel; at that inſtant he receives the electrical ‘ ſtrokes: theſe continue as long as he touches the ‘ machine, but ceaſe upon his removing his hand ‘ therefrom. Here we ſee a circulation of part ‘ of this man's electrical fire, which operates in ‘ the following manner: Firſt, the man, by apply-‘ ing one of his hands to the machine, becomes a ‘ part thereof; and by the motion of the globes, ‘ part of the electrical fire inherent in his body is ‘ driven upon the gun-barrel; but it is inſtanta-‘ neouſly reſtored to him again, upon his touch-‘ ing the gun-barrel with his other hand: thus he ‘ continues communicating the fire with one hand, ‘ and having it reſtored to him with the other ‘ as long as he pleaſes.’

The man, upon receiving the ſtrokes from the gun-barrel, becomes ſaturated with Electricity; there can be no attraction between him and the gun-barrel, they both being electrified by the ſame power: upon the man's touching the wood-work of the machine, he gets rid of his Electricity; therefore is ready to receive a freſh quantity from the gun-barrel, which he again beſtows upon the wood-work of the machine, and ſo on; and if he was to wait a ſmall ſpace without touching the machine, the Electricity he had received would fly off into the Air, and he, upon approaching his finger to the gun-barrel, would receive a freſh ſupply.

There is no circulation of part of this man's fire in this experiment: a man ſaturated with Electricity can take no more, till he has got rid of that, or part of that, which he had received.

Two perſons electrified by the ſame power have no more effect upon each other, than two that are not electrified. They are as two horſes or men, *&c.* that pull from, or puſh equally againſt, each other; neither overcoming, they produce no motion: but if two perſons, ſtanding upon two cakes of Reſin, be placed ſo nigh, as that, when their arms are ſtretched out, they might touch, and each be electrified by a different globe, one of theſe globes would act ſtronger than the other; and, conſequently, one of the perſons would be ſtronger electrified than the other, and, upon approach of their fingers to each other, the electrical ſtroke will be both felt and ſeen; till he that is the leaſt electrified receives as much Electricity from the other as to keep up the equilibrium between them; which will be in two or three exploſions, and then they can't have any effect upon each other.

Some other experiments, back'd by this, have made ſome (who think too lightly of the matter) not only to imagine, but aſſert, that all the electrical fire comes from the body Electrified, and none from the Non-electric: that the electrical particles do not meet in different directions, but ruſh on in a current one way, that is, from the body Electrified to the Non-electric; which is as much as to ſay, there is no attraction, and that there is only the repulſive force; or if they allow of attraction, it muſt be the Non-electric that attracts the Electricity from the body Electrified; and not, that the body Electrified has the power of attraction; and then where is the repulſive force? By this way of reaſoning they deſtroy either the attractive or repulſive power.

It is a known principle in attraction, that the greater body will attract the leſs to itſelf; that a perſon Electrified, and a Non-electrified one, have (for certain) the power of attracting the Electricity from each towards each other; but the body electrified muſt have the power of attracting the ſtrongeſt; and where the attractive power ceaſes, the repulſive begins; which muſt act ſtronger from the body Electrified than from the Non-electric: therefore ſome of its Electricity at that time darts into the Non-electric, as endeavouring to keep up the equilibrium; a known principle of the Air, for which it is indebted to Æther: for Air, left to itſelf, will be always the ſame; which enables bodies to bear the preſſure of the Atmoſphere.

By deſire, I have here made ſome remarks upon ſuch bodies as I found Electric, and ſuch as I found Non-electric; though, in a ſtrict ſenſe, there is no ſuch thing as a Non-electric, all bodies being endued with more or leſs of Elelectrical fire.

Of

Of ELECTRICAL BODIES.

1. THOSE bodies that repel the electrical fire, and will not ſuffer the Electricity to paſs through them, and, when excited by friction, have the qualities of Attraction and Repulſion, ſuch as Amber, Glaſs, Wax, Reſin, Pitch, *&c.* may, for diſtinction-ſake, be call'd Electrics *per ſe.*

2. Bees, Beetles, Moths, and Flies, both *Indian* and *Engliſh*, the Chryſalis's of Caterpillers that ſpin like the ſilk-worm, are electric when dry; and Land-Shells, Silk, Leather, Hair, Woolen, Tortoiſeſhell, Fat or Tallow, *Sperma Ceti*, and ſuch ſort of animal ſubſtances, though they have not the virtue of attracting and repelling, are term'd Electrical, becauſe they will not ſuffer the Electricity to paſs through them.

3. Brimſtone, Cinnabar, Tutty, a faint Electric: Camphire and other Gums are Electric.

And I have obſerved, that the Fat of Animals, and the reſinous Juices of Vegetables, are Electrical bodies, and both ſerve equally to the preſervation of the individual from whence they proceed.

Of NON-ELECTRICS.

WHAT we call Non-electrics, are ſuch bodies as ſerve for Conductors of Electricity; *viz.* all that will ſuffer the Electrical fire to paſs through their pores. It was generally thought, that all animal ſubſtances, when dry, would not convey Electricity, wherefore they were term'd Electrics; but among the following are ſome animal ſubſtances, which, when dry, I have tried, and found conveyers; therefore they are Non-electric.

1.

1. The Jaw of a Shark, Sea Unicorn's Horn, Sword of the Sword-fiſh, Joints of the Back-bone of a Whale, Horn of a Rhinoceros, Stag's Horn, Elephant's Tooth, human Skeleton, Bones in general.

2. Bones, Arteries, Veins, Muſcles of a Boy preſerved.

3. Skin, Bones, Muſcles belonging to it, and Hoof of an Elk; but no great conveyer.

4. The Sea-Turtle, Pizzle of a Whale, and Sea-Shells in general, Crocodile, Flying Fiſh, and Old-Wife.

5. Skin of the ſcaly Lizard; but not a great conveyer.

6. Oils of Hartſhorn and Vitriol.

7. All ſorts of Waters.

8. Moſt kinds of Earth, and Stones, even the Loadſtone.

9. All Animals alive or dead, if the fluids are in the body, are Non-electrics, being great conveyers of Electricity.

10. All Vegetables, while growing, are Non-electrics; moſt part when not growing.

11. Minerals, ſuch as Alum, Vitriol, Salt-petre, and Antimony.

12. Metals in general.

1. We find, among the liſt of Electrics and Non-electrics, that the Chryſalis's of thoſe Caterpillers that creep into the Earth, to change into the Aurelian State, when dry, are Non-electrics.
2. But the Chryſalis of that Caterpiller which ſpins like a ſilk-worm, is Electrical.
3. Sea Shells in general are Non-electric.
4. Land-Shells Electrical.
5. Oils made from the parts of Animals, or Vegetables, that are in themſelves Electrics, will be

be Electrical; ſuch as Train, Turpentine, and Linſeed Oils.

6. But Oils made from Metals and Minerals, as Oil of Vitriol, or from parts of Animals that are Non-electrics, as Hartſhorn-Oil, are Non-electrics.

This Æthereal or Electrical Fire I take to be the vivifying ſpirit that reſides in Air, which, taken into the lungs of an animal, is ſeparated from the heterogeneous particles, and thoſe watry and earthy particles are again immediately repell'd out of the lungs; but the pure fire ſwiftly paſſes over the whole body, which, mixing with the blood, keeps it in due fluidity, and free from coagulation; for moſt fluids are both Retainers, for ſome time, and great Conveyers of Electricity; the Æther ſeeming to agree more with fluids than any thing elſe, and to ſtay longer with them. This keeps the fibres in due vibration, and the fluids in proper motion, actuating the whole maſs; but changes, as heat and dryneſs, cold and moiſture, *&c.* alter the Elaſticity of the Air, keeping open and cleanſing the moſt minute pores and paſſages of the body.

Without this fire in the Air, the culinary fire could not be kindled, nor life preſerved. It has been found by experiment, that what is not good for one will not ſerve for the other; that Air, taken out of the lungs will neither feed life nor flame. As it is the great medium of Reſpiration, ſo it is of Digeſtion, Sanguification, Nutrition, Pulſes of the Heart, and Muſcular Motion; and I believe it to be what ſome call the Animal Spirits; as for other qualities of the Air, iron and copper are corroded, and gather ruſt in the Air, and all ſorts of bodies are corrupted and diſſolv'd.

By this is ſhewn an acid diffuſed throughout the Air; and, as the Biſhop of *Cloyne* obſerves, Air is as a general Agent, exerting its own, and calling forth the qualities or powers of all other bodies, by a diviſion, comminution, and agitation of their particles, cauſing them to fly off, and become volatile. In animals living or dead, their fluids are as a vehicle to Æther. The animal, while alive, has Heat, and Heat; according to the Peripatetics, will attract homogeneous things, and diſperſe heterogeneous, which keeps the body from corruption; but when dead, and that Heat has left the body, the heterogeneous particles have power to act upon it; there being no drug, ſalutary or poiſonous, whoſe virtues are not breath'd into Air. Here we find the Æther cohering with heterogeneous particles on one hand, dividing, abrading, and attracting the volatile particles of all bodies, that are in the ſtate of corruption, into Air, and there preſerving thoſe particles, as in a ſafe Repoſitory, till a proper ſeaſon to beſtow them again in new generations. Acid volatile Salts, Earth, and Water, are nutriment to Vegetables, theſe to Animals; and the volatile Salts of Animals, while in a ſtate of putrefaction, fly off into Air again, mix with the Earth and Water; which keeps up the round of putrefaction and generation.

Having given this account of the nature and properties of Air and Æther (wherein the expreſſions Electricity, Electrical Fire, and Æthereal Fire, are ſynonymous) and alſo of what ſubſtances I have found to be Electrics, and what Non-electrics, it now remains that I ſhould verify the doctrine by experiments, and make ſome remarks thereon; which is humbly offered in the manner following:

1. The late ingenious Mr. *Hauksby* was the firſt that made uſe of the glaſs globe, in what he called his Attrition-Engine; he exhauſted all the Air out of it, and when it was whirl'd round, and the particles of glaſs put into motion, by the attrition of the hands, the Electricity acted wholly within the globe, and appear'd as a flame of a purple or reddiſh colour, filling the whole globe, which diſappeared by degrees, as the Air was gradually admitted into the globe.
2. Circular ſtrings of threads being fix'd on the Axis in the centre of the globe, and a ſmall diſtance from each other, the globe being put into motion, and giving a proper friction to it, all the threads extend themſelves from the centre to the inner ſurface of the globe, and nearly repreſent the ſpokes of a Coach-wheel, being expanded by the Electricity acting through the pores of the glaſs.
3. If the hand of a Non-electric be moved towards the ſurface of the globe, the threads within move every way towards the hand: which ſhews that the Electricity attracts through the pores of the glaſs; and as the electrical particles move towards the hand, they bring along with them the points of the threads.
4. Place a hoop of threads about the globe in motion, and the threads faſten'd to the hoop will be attracted towards the ſurface of the globe.
5. The Room being darken'd, the ends of the threads on the outſide of the globe will appear luminous; but the threads within exhibit no light.

In theſe laſt experiments the globe is not exhauſted, as it is in the firſt: which demonſtrates, that when the globe is not exhauſted, the Electricity acts outwardly; but when exhauſted, inwardly.

A SYLLABUS of the
EXPERIMENTS
Which I Exhibit.

EXPERIMENT I.

A FEATHER being ſuſpended by a hempen or flaxen thread, and held near an electrified body, will be ſtrongly attracted thereby, and adhere immoveably thereto; the Electricity being convey'd away through the thread, as faſt as it receives it from the electrified body.

EXP. II.

If a Feather be ſuſpended by a ſilken ſtring, it will be firſt attracted, and then repell'd; and continue ſo till it has touch'd a Non-electric; then it returns again to be electrified, and ſo on. The Silk will not convey the Electricity away; ſo the Feather acts as light bodies, that float in air.

Exp. III.

All ſuch light bodies as will float in the Air, as thiſtle or feather-down, &c. or raſpings of cork, leaf-gold, ſeveral ſorts of ſeed, &c. if nigh an Electrified body, will be attracted, and then repell'd; but if touch'd by a Non-electrified body, before it be out of the ſphere of action, it will return to the body electrified, and will be again repell'd. For when theſe light bodies, being electrified, touch a Non-electric, they loſe their Electricity: they are put into the ſtate they were in before electrified, and conſequently ready to be freſh attracted.

Exp. IV.

To ſhew attraction and repulſion at the ſame time, you muſt have a little plate of metal, about two inches in diameter, made ſmooth, and fixed to the gun-barrel ſo as to be electrified; put ſome Raſpings of Cork, &c. thereon; alſo take ſome of the ſame on the blade of a knife, and hold it under the plate, at two or three inches diſtance; then laying one of your fingers on the gun-barrel, cauſe it to be electrified; and when you take your finger off, that which lies upon the plate will be repell'd upwards, and that on the knife attracted upwards at the ſame inſtant.

Note, What is attracted upwards, as ſoon as it touches, is repell'd; and that which lay upon the plate, upon your taking off your finger that inſtant is electrified and repell'd.

Exp. V.

Suſpend a gun-barrel, or any metallic body, by ſilk lines, and apply the finger to within about half an inch of it when electrified, and you will receive a ſmart ſtroke, ſee the fire, and hear the ſnap by the Electrical exploſion. The electrified body and the Non-electric act equally alike. You may obſerve the fire to be attracted from the end of your finger, if the top be wet, and approaching the electrified body; or from the end of a key, &c. if held in your hand. This fire is attracted with vigour from the Non-electric; and ſince you may hear a ſinging noiſe as it paſſes through the pores, it is plain it is attracted with force; and if you move the key a little nigher, the fire comes from the gun-barrel: with great force they meet, and action muſt ceaſe, if they did not explode. So, according to Sir *Iſaac Newton*, whatever attracts with the greateſt force, flies aſunder with the greateſt force, as is above obſerved; which any one that tries the experiment might witneſs that this does, by the percuſſion they feel when it explodes itſelf.

Exp. VI.

A perſon electrified, ſtanding upon Reſin or Bees-wax, acts in the ſame manner as the metallic bodies; but the animal body being endued with feeling, upon the touch of a non-electrified perſon, will have the ſtroke as ſmartly as from the gun-barrel, and both feel it equally.

Exp. VII.

If wood, ſtone, &c. whoſe bodies are not ſo denſe as metal, be electrified, you hardly feel the ſtroke, the exploſion being weak: this effect in bodies being always in proportion to their denſities.

Exp. VIII.

A perſon electrified drawing the edge of a ſword acroſs the arm, leg, *&c.* of a non-electrified perſon, the latter ſhall feel as if he was cut, and ſo *vice verſa* the ſame: and if the point be puſh'd by either againſt the other, he that receives the ſeeming thruſt ſhall feel it like a ſmall ſtab.

This is accounted for in *Exp.* 5. only with this difference, that the drawing the ſharp edge of the ſword cauſes a great many of the ſmall but ſmart exploſions; which makes it feel like notching or cutting the fleſh.

Exp. IX.

The perſon electrified holding a ſword in his hand, and the Room darken'd, a continual bluiſh flame iſſues out at the point in diverging rays; and if a Non-electric holds his hand before it, ſhall feel a cool blaſt of wind; the ſame is felt from the ends of ſmall wires, points of penknives, *&c.*: and if the non-electrified perſon holds the ſword, and the electrified one applies his hand, the effect is the ſame.

The gun-barrel, wires, *&c.* that are ſuſpended, cannot have an Atmoſphere ſo perfect as thoſe bodies that float in Air; nor will they keep their Electricity ſo long. The lines they are ſuſpended by, the wire, tinſel, *&c.* that touch the glaſs globe; and beſides, the particles of Æther ſeem to have a peculiar propenſity to fly through all Non-electrics that are properly ſuſpended; and being violently puſh'd forward by freſh particles of Æther ruſhing on theſe things, muſt be ſome hindrance to the perfecting of their Atmoſphere; and when the Electricity comes to the extreme ends of the wire, &c. it cannot return back, but flies off in diverging rays of light.

Exp. X.

A perſon electrified pointing one of his fingers, as if to touch ſome warm ſpirits of wine held to him, or ſet upon a Non-electric, communicates fire to the *effluvia* thereof, which ſets the whole on fire. The like may be done to all inflammatory fluids. So if the perſon Electrified holds the ſpirits, the Non-electric can ſet fire to it. The manner the electrical fire meets is explained in *Exp.* 5.

Exp. XI.

A man ſtanding upon the ground takes the electrified phial of water in one hand, and the warm ſpirits in the other, and brings the top of the wire of the electrified phial nigh the ſpirits; they will take fire, and he receive a ſhock. As the fire is attracted from the Non-electric, the ſame is attracted to meet it from the Electrified body: they attract the fire of each other. In this experiment the phial of water is the Electrified body, and the ſpirits and perſon that hold it the Non-electric; and when the two electrical fires meet, they explode themſelves amongſt the *effluvia* of the ſpirits, and ſet them on fire. As for the ſhocks, they will be accounted for in *Exp.* 30.

Exp. XII.

If you draw water by a capillary Syphon, you may ſee it come away by drops; but, as ſoon as electrified, it will run off in a full ſtream. If the Room be dark, the water will look luminous. Much the ſame is to be done with a wet ſponge.

Exp. XIII.

If you ſtand upon a cake of reſin, and touch the back of any one's hand, to ſhew that you are not electrified, and continue your finger very nigh their hand, while you put your other hand about an inch from the bottom of the ſyphon, to receive a drop of the electrified water; that inſtant they will receive a ſmart ſtroke on the back of their hand from your finger: and inſtead of holding the back of their hand, if they were to hold ſome warm ſpirits, the ſpirits would be ſet on fire, Which ſhews how much the water conveys it, and how active and great the expanſion of Electricity is.

Exp. XIV.

If the pot and ſyphon be taken in the hand of a non-electrified perſon, it will only drop; but if it be brought nigh an electrified body it will be attracted, and run a full ſtream; and the Room being darken'd, the ſtream will look luminous, as before obſerv'd: but if brought to the edge of a metal plate that is electrified, the ſtream will not only look like fire, but you may alſo obſerve another fire coming from the plate in diverging rays to meet it, and that in a curve.

This proves the fire coming both from the electric and the non-electric at the ſame time; and ſo do ſeveral other experiments. If there are two perſons, one electrified, and the other not, and each of them wet with ſpittle the top of one of their fingers, and approach the two fingers to within about an inch, there will iſſue a bluiſh flame from each of their fingers, and meet together: and if the fingers approach nigher, the ſtream will become more denſe, and explodes, and both perſons feel the percuſſion. Or if they have a piece of thiſtle-down between them, it will be attracted by the perſon electrified, and then repell'd; but, upon the touch of the non-electric perſon, it loſes the Electricity it had received from the electrified one, ſo flies back to him for more; thus imitating a ſhuttle-cock, in its being ſent forwards or backwards by the perſons that play with it. But if the non-electric perſon, inſtead of touching the thiſtle-down, preſents the point of a needle, pin, or penknife, towards it, the thiſtle-down will be fixed to the electrified body, and not have power to move till the point is remov'd, and then it will be immediately repell'd as before. The ſame, if the electrified body preſents the point; it then will be fixed to the non-electric. It is certain that the electrified and the non-electric act much alike.

EXP. XV.

If a large plumy Feather be ſtuck in a cork, and ſet upon a ſtand, and ſo electrified, or held in the hand of an electrified perſon, it is ſurpriſing to ſee how it will become turgid, the fibres expanding themſelves every way from the rib; but if any of the electric parts in contact (let the diſtance be what it will) be touch'd by a non-electric, it inſtantly ſhrinks, as if ſenſible of the touch. Thus far it imitates the ſenſitive plant, but no way ſolves it.

The downy Feather being animal and dry, the electrical fire will not paſs through it: it is not a conductor of Electricity. I have obſerved, that a body electrified will attract all light bodies, whether electric or non-electric; and the tender fibres of the downy Feather are expanded, and the ſmall points thereof endeavour to recede from each other, by means of the electrical *effluvia* getting in between the plumes of the Feather; which is agreeable to what Sir *Iſaac Newton* ſaith, when he ſpeaks of our Atmoſphere, as being nothing elſe but the particles of all ſorts of bodies, of which the earth conſiſts, ſeparated from one another, and kept at a diſtance by pure Æther, as is above-mention'd: but ſo inſtantaneous is the motion, that a Non-electric no ſooner touches any part that is Electrified, but the Electrical fire that inſtant makes its eſcape through the Non-electric into the floor, and mixes with the univerſal electrical fire; and as the electrical Æther that expands the Feather is attracted from among the *plumulæ* of the Feather, it brings them down with it, which makes them to ſhrink, as ſenſible of the touch.

Exp. XVI.

While the Feather is electrified, it looks brisk, as if growing like a plant; and if you bring a ſmall Needle, with your finger before the point, to within 10 inches of the Feather, then ſuddenly taking your finger away from before the point of the Needle, all its expanded fibres as ſuddenly contract, and cloſe together.

In the experiment of the Sword, N°. 9. it was obſerved, that the Electrical body and the Non-electric act alike: and when the Non-electric holds the point of a Needle nigh the Feather, the electrical *effluvia* are attracted from him, through the point of the Needle, in the ſame manner, and feel like a cool air, as in the experiment of the Sword, whoſe particles being in different directions to thoſe which expanded the Feather, repel them, and cauſe the tender fibres to contract.

Exp. XVII.

I have a round copper Plate, ſuſpended by ſilk lines in the middle of the Room, that ſerves for ſeveral experiments; and when it is electrified, if there be brought a Leaf of Gold on another Plate, and held under the copper one, the Leaf-gold will be attracted up; and if the under plate be moved after it, the Leaf-gold will be ſuſpended between the two plates, the proper diſtance being readily found, the Leaf being nigheſt to the Non-electric; but by ſticking a little bit of the Leaf-gold to the edge of the under plate, or by ſuſpending of it by the point of a penknife, needle, *&c.* I have often found the Leaf to be nigheſt to the electrified body.

The Leaf-gold, in my opinion, is ſuſpended by the mutual attraction; the upper plate, being electrified, would electrify the Gold, and repel it; but the Non-electric, being moved after it to a proper diſtance, takes off the Electricity as faſt as the upper plate electrifies: ſo one attracts to electrify, the other to take it off; and the Leaf has its attraction both ways. If, inſtead of the under plate, you hold the back of your hand, you will find the electrical fire blowing like a cool wind againſt it: it is plain that what fire the Leaf-gold receives from the Electrified body, it beſtows upon the Non-electric.

Exp. XVIII.

I have a large Pewter plate, laid on a proper ſtand, and a circular Rim of Braſs, with three feet made of Sealing-wax; and when I put this Rim of Braſs upon the Pewter, I electrify it by a ſmall wire; the feet of ſealing-wax prevent the pewter plate from being electrified, and ſupport the braſs Rim about half an inch from the pewter. The Rim is made in the ſhape of that which is thought to be deſcribed by the Earth in its revolution about the Sun: I have alſo ſome Glaſs balls about an inch and quarter diameter, blown very light; and when I put one within the braſs Rim, and nigh the braſs, it will be attracted, turn upon its Axis, and revolve at the ſame time; which, in ſome meaſure, imitates the earth in its Diurnal and Annual motions.

In this experiment is ſhewn the mutual attraction; the Pewter Plate takes off the Electricity as faſt as the braſs rim electrifies the glaſs ball: if it was not to touch the Pewter Plate, it would be firſt attracted, and then repell'd; and, being glaſs, it will be electrified moſtly at that part which touches the electrified body; it does not act like to a ball of iron or copper, *&c.* which would become electrified all over alike. The glaſs ſphere can't touch the braſs rim but at one point at a time; and, conſequently becoming the moſt electrified at that point, and in ſome meaſure repell'd; and then a freſh point of the ſphere attracted, and in the foregoing manner repell'd; and by this means it is cauſed to turn upon its Axis, and to revolve.

Exp. XIX.

Darken the Room, and the glaſs Ball will be beautifully illuminated in its revolution, but more particularly at its poles.

Exp. XX.

I have another flattiſh Rim, made in the form of an egg, and with that I can make two Balls run, one within, and the other without; one from Eaſt to Weſt, and the other from North to South, at the ſame time. When I firſt diſcover'd this experiment, I made the little glaſs ball to revolve round a large copper ball.

N. B. I could make as many of theſe Balls to revolve as there are Planets.

Exp. XXI.

Take a well-ſhap'd Rabbit's Bladder; let it be well-clean'd, and blown up tight; tie the end with ſome ſowing-ſilk; this I call the upper end: ſtick to the bottom ſome gold Leaf, letting a little hang down. This ſerves to regulate its motion, as a flie does to a piece of Clock-work; for without this it would be only attracted and repell'd. I hung upon the gun-barrel a copper-ball, about four inches diameter; it was hollow, turn'd ſmooth, and poliſh'd: when I electrified it, I brought a bladder in a ſalver, and held it under it: the Ball being electrified, and the Salver not, I ſuſpended the Bladder, which ſeem'd to hang by a ſtring of fire. When this experiment ſucceeds well, from the bottom of the Bladder to the Salver are ſeen diverging rays of fire. The ends of the Bladder I call its poles; for it keeps turning all the time of its ſuſpenſion; wherefore it acts like the ſun, revolving upon its own Axis.

The Bladder is ſuſpended, as Leaf-gold, by the mutual attraction. If you hold the back of your hand under the Bladder, you will have a much ſtronger current of Æther blowing againſt it than in the experiment of the gold Leaf. It is ſurpriſing (ſome will ſay) how a current of Æther, ſetting through the Bladder, ſhould ſuſpend it! I have obſerv'd, that the excited globe has the power of attracting and looſening this electrical fire from the watry and earthy particles that reſtrain'd it;

that bodies electrified are endued with the quality of attracting the particles of Æther that are in Air; that the particles of Æther have undoubtedly the virtue of attracting; and as they are attracted by the electrified bodies, they bring along with them all light bodies that are in their way. In this manner I imagine the Bladder or Leaf-gold, *&c.* to to be kept nigh to the copper ball electrified, by the particles of Æther being attracted in all directions to it; that the current of Æther, which we feel like cold air againſt our hands, is the Electrical fire that would repel it, and not that which did attract it towards the copper Ball: but the Non-electric, being held pretty nigh, takes off the electrical *effluvia* as faſt as they come from the electrified copper Ball, and prevents its forming an Atmoſphere to the Bladder, whoſe pulſes would tend to the centre of the Bladder, and be in different directions to thoſe of the copper Ball. I ſay, it prevents it from being ſtrong enough to repel it. And here we find the Æther attracted to act ſtronger (being help'd by the Non-electric) than that which comes from the copper Ball.

As there is the force of Gravity againſt its ſuſpenſion, if we conſider the freſh influx of Æther continually coming into the Ball, by means of the excited glaſs globe; and the efflux going from the copper Ball, by or through the Bladder into the Salver, and through the Perſon that holds it, and ſo into the Floor, whence it mixes again with the univerſal pure Æther, and at the ſame time allow, as we have obſerv'd, that the copper Ball will attract the particles of Æther in all directions, I conclude the action of theſe particles, in ſuch different directions, muſt be the occaſion of the Bladder turning upon its own axis.

Exp. XXII.

Take a thin glaſs Phial, fill it two thirds with water, and let it be well-cork'd, with a wire paſſing thro' the cork nigh to the bottom of the Phial, leaving the upper part of the wire about ſix inches above the cork; then bend the wire, ſo that it may hang upon the gun-barrel: if you hold the Phial in one hand, letting the wire touch the globe while in motion, or the gun-barrel while electrified; by this means the water becomes electrified; and if you attempt to touch the upper part of the wire with a finger of the other hand, you will receive a ſtrong ſhock at the elbows, ſometimes acroſs the breaſt, and ſometimes all over the body; eſpecially if the perſon be ſubject to the Rheumatiſm, or paralytic diſorders.

Exp. XXIII.

Take a piece of gilt Leather; hang it to the gun-barrel by a couple of bent wires, and electrify it; then approach to touch it with a large Key, or any ſubſtantial piece of Metal, and the electrical fire will dart in a ſurpriſing manner on the metallic ſurface, and very much reſemble Lightning; the Leather being a little rumpled will make it act the better.

Leather, being dry, cannot be electrified; but the Metal upon it will; which, being laid very thin upon the Leather, and being very porous withal, numbers of little parts not touching, upon the approach of the knuckle, or a ſubſtantial piece of metal, the electrical fires are attracted from both; which, meeting, explode, and are ſeen upon the metallic ſurface in numberleſs exploſions, or little ſparks of fire darting about in different directions, and thoſe in a moſt beautiful variety of colours, which very nigh reſemble Lightning.

Exp. XXIV.

Electrify a piece of gilt Leather, and a Phial of Water, at the ſame time; with a pair of tongs take hold of the Phial, and with the head of the tongs touch the Leather, and there will be a very loud Report, and a Light ſufficient for any body to diſcern every feature of thoſe who ſtand nigh it, if the Room be made dark. As the other imitates Lightning, this may be ſaid to imitate Thunder. The reaſon for its acting ſo much ſtronger is accounted for in *Exp.* 30.

Exp. XXV.

To the gun-barrel ſuſpend an Egg by a ſmall wire, and the Phial of Water at half a yard's diſtance from the Egg, and electrify them. Take hold of the Phial with one hand, and move the palm of the other ſlowly towards the bottom of the Egg; and when it comes to within half an inch of it, you will receive a ſmart ſtroke; and though you were ever ſo determin'd not to touch it, you cannot forbear hitting it; at which time it gives you a ſhock, and very ſenſibly affects the arms.

One might think this may help to account for Muſcular Motion; for it has this effect upon the nerves, to cauſe the muſcles to be contracted the natural way. If I hold the palm of my hand under the Egg, my muſcles, being contracted the natural way, make me ſtrike the Egg; but if I apply the back of my finger, the muſcular contraction naturally hinders me from ſtriking it.

Exp. XXVI.

Hang the Phial of Water at one end of the gun-barrel to be electrified. Here you may obſerve, that the Phial I make uſe of is about 12 inches high: the lower part and bottom, for this experiment, I cover with gilt Leather, almoſt 7 inches; ſo that the cork-part and 4 inches are left uncover'd. When I cover it, I work a piece of wire in with the Leather, ſo as to make a ſmall loop juſt at bottom, which ſerves to hook one end of a large Jack-Chain to, of about 6 or 8 yards in length, or longer if you pleaſe; ſo laying the Chain round the Room, take hold within 7 inches of the other end of it, which 7 inches of Chain muſt hang downwards, holding your hand about 4 inches higher than the gun-barrel, as if going to touch it with the end of the Chain, which when brought within a proper diſtance, it will ſnap, and the whole Chain become illuminated.

1. This experiment is upon the very ſame principles, as when the whole company join hands; and it plainly ſhews how the electrical fire darts through the company in that experiment. 2. If one part of the Chain is laid upon the other, it will not affect any ſuperfluous part; but takes the readieſt way from the Phial to the Gun-barrel, and from thence to the Phial. 3. In the ſame manner, if a perſon ſtands upon the Chain, and approaches with a knuckle to the gun-barrel, he will receive a ſhock in the arm and legs, eſpecially in that next the Phial: ſo that the nigheſt way is from the Phial to the feet of the perſon that ſtands upon the Chain, through them to the Gun-barrel, or from the Gun-barrel through the perſon to the Chain, and ſo to the Phial. 4. If any number of perſons communicate by pieces of Wire, and one of them brings together the ends of the two pieces of Wire

in his hands; upon touching the gun-barrel he will receive no ſhock; the Electricity having no occaſion to paſs through him, as finding the readieſt way through the Wires. 5. The Chain looking luminous is owing to the links, and the manner of their linking together, which does not cauſe them to touch; and it is in thoſe parts which do not touch that we ſee the electrical fire; its exploſion being confin'd to thoſe parts only.

Exp. XXVII.

A perſon ſtanding upon a cake of Reſin, holding the Phial of Water by the Wire in one hand, and a Baſon of Water in the other, and is electrified; another, ſtanding upon the ground, graſps the lower part of the Phial with one hand, and endeavouring to touch the middle of the Water in the Baſon with one of his fingers of the other hand, or with a large Key, they both receive a ſhock.

N. B. It is to be obſerv'd, that, at the approach of the Finger or Key to the Water, the Water riſes up in a ſmall cone, and a ſnap is to be heard, and the fire to be ſeen, eſpecially if the Room be dark.

Query, Whether the Water's riſing up in a ſmall cone might not help to account for the Water-ſpouts at ſea?

Exp. XXVIII.

If a Lady electrified ſtands upon Reſin, and holds the Phial of Water by the Wire in her hand, and a Gentleman graſping the lower part of the Phial, as he ſtands on the ground, and if both endeavour all that is in their power to ſalute, they cannot: no ſooner do their heads come within about half an inch of each other, but they meet with a mutual rebuff, that will cauſe them to fling their heads back much quicker than they endeavoured to meet. They are very apt to clap their hand to their face, as if it were to feel whether their head be in its place; for it makes it ring, and cauſes them to forget that they were going to ſalute. This ſhews the effect it has upon the nerves to make the muſcles contract the natural way; for the chief muſcles of the neck are in the back part of it.

Exp. XXIX.

Get four Pillars, about fourteen inches high, fix'd at the bottom to a board twelve inches ſquare, to keep them firm; upon the top of the Pillars lay two pieces of Wood acroſs in right angles; get 5 ſmall Bells, hang the largeſt where the two pieces touch that are laid acroſs upon the top of the Pillars, which is the centre, by a piece of ſilk line, to keep the Bell about 3 or 4 inches from the Wood; the other 4 you muſt hang round the Centre-Bell by ſmall Wires; the bottom of each of theſe Bells muſt be about an inch and quarter from the bottom of the Centre-Bell: theſe Bells are to be without Clappers; but ſomething like a Clapper muſt be hung by ſewing ſilk, between the central and each of the other 4 Bells. The Clappers and the 4 Bells may be hung by making a ſort of loop to the ſilk, and the wire by which they are ſupported, that they may be moved nigher to or farther from the Centre-Bell, as requiſite; then convey a Wire to the Centre-Bell, which you electrify by itſelf, becauſe it is ſuſpended by Silk; and the Clappers being hung by Silk, will be attracted by the Centre-Bell electrified, and repell'd againſt the 4 outward Bells, which (being hung by Wire) takes off the Electricity from the Clappers, and they are again attracted and repell'd by the Centre-Bell, *&c.*

Exp. XXX.

Let one take hold of the electrified Phial of Water pendent to the gun-barrel, the whole company joining hands, the laſt having one hand at liberty, with which he is to attempt to touch the gun-barrel; but at the approach of his finger, or one of his knuckles, to within half an inch of the gun-barrel, the whole company receives an inſtantaneous ſtrong ſhock. This experiment may be tried upon any number of perſons at once.

To help to ſolve this experiment, I am going to mention another.

If a perſon ſtand ready with the Left-hand to touch the gun-barrel, *&c.* with one of his knuckles, and a ſecond perſon put one finger of the Left-hand on the back of the Right-hand of the Firſt perſon, and in the ſame manner a Third on the back of the Right-hand of the Second perſon, and ſo on, and the Firſt perſon approach his knuckle towards the gun-barrel, he receives a ſmart ſtroke as uſual on the knuckle; but all the reſt, at the ſame inſtant, feel a ſenſation like a ſtrong pulſe, beating againſt the finger of their Left-hand, and in the back of their Right-hand; except the laſt perſon, who is hardly ſenſible of it.

In this experiment the whole company is affected, though but weakly, (they receiving the repulſive force but one way): but, in this experiment, we find the Electricity flying through the whole company, before it gets into the floor. But if the firſt perſon graſps the Phial of Water, and all the company join hands, the laſt perſon of the line approaching with one of his knuckles towards the gun-barrel; at that inſtant all the company receive a ſtrong and ſurpriſing ſhock.

I have obſerved, that all the fire does not come from the Electrified body, but it attracts fire from the Non-electric; and at the ſame time fire comes from the Electrified body, to repel it: when theſe two fires meet (if the expreſſion be allow'd me) the particles being the ſame. *viz.* the Electrical fire or Æther, only attracted in different directions, which cauſe them to repel one another, I ſay, when they meet, if the Electrified body has not power to repel the Non-electric, it cauſes the exploſion which we hear, and feel the violence of when it flies aſunder. But to the point; when the laſt perſon approacheth the gun-barrel with his knuckle, the company begins to attract the Electricity from it, and that from them, for if we conſider, the whole company joining hands acts as one body, and, at the ſame time, the electrified Phial begins to exert itſelf, and to attract the Æther from the Company towards it, and the Company to attract the Æther accumulated in the Phial towards them. In this poſition the Non-electric attracts every way from the Electric body, and the Electrified body every way from the Non-electric, and the Electricity ready to break forth into action, upon the nigher approach of the knuckle like gun-powder, which the more it is compreſs'd the more it explodes. Upon the nigher approach of the knuckle, the repulſive force breaks through the Phial (it being of thin glaſs), and with violence repels the Electricity through the whole company one way, and the repulſive force darts through the company the other way from the gun-barrel; ſo when the particles of Æther meet in different directions, they always repel each other; and in this experiment they meet in each perſon that is in contact, and the repulſive force is felt within them, which cauſes that ſurpriſing ſenſation, which they all feel at the ſame inſtant.

Exp. XXXI.

Turn a piece of pumice-ſtone round, and as ſmooth as poſſible, making a hole in it for a wire to be thruſt through the centre, to ſerve as poles to turn it by ; dip it in water, then ſtand upon a cake of Reſin, and be electrified, turning the pumice gently upon its poles; then let a Non-electric be held near the ball electrified, the water on the ſurface will be ſeen to riſe always towards the Non-electric. This experiment might help to account for the Tides ; which was the opinion of Mr. *Wilſon*, who diſcover'd this experiment, and that of the ſilver Leaf.

Exp. XXXII.

Suſpend a copper Plate of about 10 inches diameter by ſilk lines, and electrify it ; get a Pewter Plate ſixteen inches diameter ; fix it upon a ſtand that may be moved up and down upon occaſion ; place it under the copper Plate, move the ſtand upwards to within 6 inches of the Copper Plate ; then if you ſet on the Pewter Plate upon their feet ſome groteſque figures, ſuch as Harlequin, Punch, Pierrot, *&c.* drawn upon and cut out of very thin paper, you will have a delightful entertainment in dumb ſhew, the figures dancing in a briſk manner, and as if they had ſome deſign in what they were about.

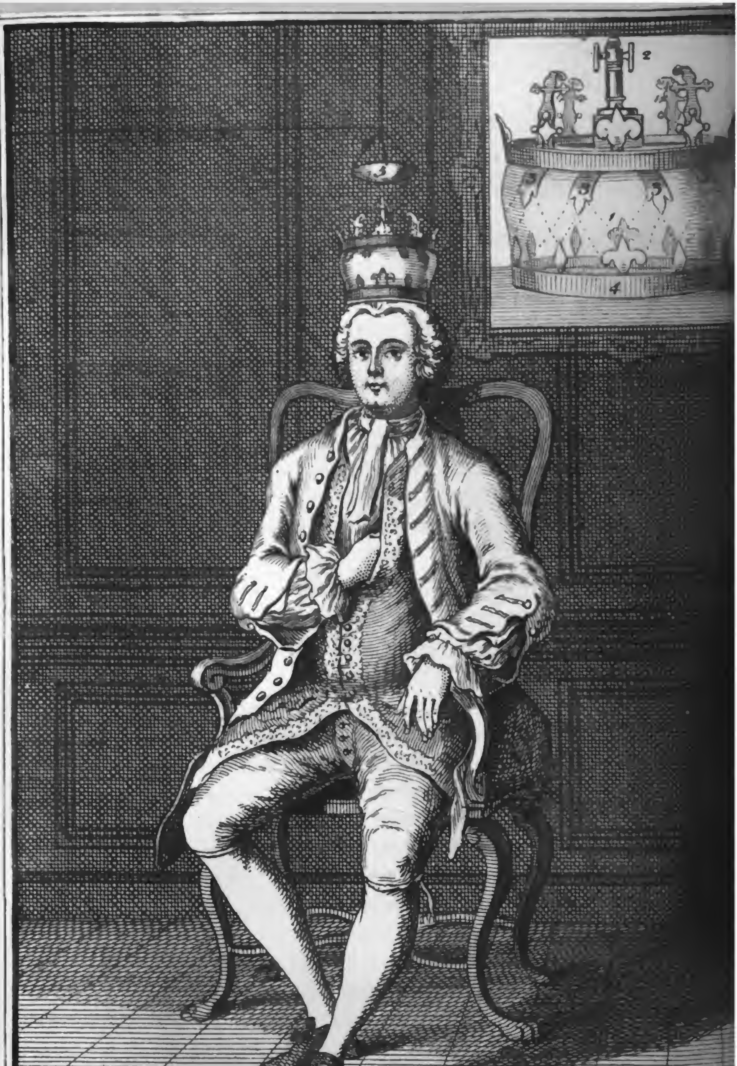
This is really a diverting and ſurpriſing experiment ; for each of theſe little figures form to themſelves an Atmoſphere, of an elaſtic nature, which prevents their touching each other; and if you move your hand towards them, they ſeem to be puſhed from you, by that time you come within two inches of them.

This is agreeable to Sir *Iſaac Newton*'s Æther, which he ſays keeps all the particles that impregnate the Air at a diſtance from each other; but if one of theſe little figures, full as tall as the others, ſhould happen to be much lighter than the reſt, it will be attracted and repell'd, and cannot be at reſt till it becomes join'd to another: upon its being attracted to the Upper Plate it becomes electrified, and often by that means will attract another to it. There is alſo an Atmoſphere immediately form'd to them both; which makes it ſomething reſemble matrimony, for they dance as one body, as long as their ſpirits will ſuffer them.

A ſilly fellow, that advertis'd againſt this experiment, after a fulſome puff of himſelf, ſays as follows:

'Where it is preſumed no late improvements 'will be expected (no, I believe not—of *his own*) 'to be added to the courſe, but ſuch as, in their 'own natures, afford matter for the moſt ſolid 'Inquirers; ſuch as may probably lead us to 'the cauſe, and thereby point out ſome grand 'and important effects, inſtead of thoſe Emblema'tical dances the ignorant boaſt of, which tend 'to debaſe the nobleſt principle in nature, by bring'ing its properties into contempt and ridicule.'

Why? becauſe they are diverting? Does not the mind require ſome relaxation? Would he have others as dull as himſelf? But the true cauſe, as I take it, was my refuſing to ſhew him the experiment of the Chair and Crown; and telling him at the ſame time he had us'd me ill, in advertiſing



1. The Glaſs Crown.
2. Stop Cock.
3333. Points turnd downwards.
4. Braſs Bottom.
5 5. Electric plate & Wire.

the laſt experiment I had ſhewn him as his own, making the greateſt puff of it, and calling it *His Electrical Orrery*. He is, in his *own* opinion, a Great Philoſopher; but can't perſuade any body elſe to think ſo; people being obſtinate, and of another opinion.

I expect that ſome of thoſe ingenious gentlemen, that ſell Twelve-peny Chops of Electricity as well as myſelf, will advertiſe againſt me and my book; but I am contented, as it may be a means of ſending me cuſtomers, both for the Book and Electricity.

Exp. XXXIII.

The method I made uſe of to ſeparate the Electrical fire, or Æther, from thoſe particles that clogg'd it, was, by getting a Glaſs Receiver made in the ſhape of a Crown: the top of the glaſs Crown had a neck like to the end of one of the glaſs globes which we make uſe of; to this neck I fixed a Cap of Braſs, with a ſtop-cock in the ſhape of a croſs; in the inſide of the Glaſs I put a Tin Plate, cut round like the top of the Glaſs, and dividing the Tin Circle into eight parts; I had the Tin cut in points like the middle part of a fleur-de-lys, and turn'd downwards, with an intent, that when the top was electrified, theſe points might convey the Electrical fire to the bottom, which is a Plate of Braſs, and acts as a Non-electric, and attracts the Fire from the Top Plate, which is to be electrified; then fixing it to an Air-Pump, I exhauſted all the Air I could out of it. I had a Chair made, with a Back to move up and down at pleaſure; from the top of the back was a projection, of about 9 inches, over the ſeat of the Chair, wherein a circular cavity was made to receive the Bottom of the Crown; and when any perſon ſat in it, by means of the Back moving up and down,

I could

I could place the Crown on the head of the perſon ſitting in the Chair; over the top of the Crown I hung a Plate of Metal, about five inches diameter, to move up and down like a chandelier: this Plate I could electrify by a wire I convey'd to it; ſo when I perform'd the experiment, I mov'd the Plate ſo nigh the Crown, that, when electrified, a continued ſtream of Fire would appear between the Plate and Crown, and the Crown look luminous, as if almoſt fill'd with fire, by numberleſs rays of light darting in different forms from top to bottom in a glorious manner.

I muſt here obſerve, that the Perſon and Chair are not electrified; there being no reſinous body between them and the boards; yet the Perſon ſitting in the Chair will receive ſo much of the Electrical fire, that it ſhall be very ſenſibly both felt and ſeen by any one that attempts to touch him.

The firſt time I made this experiment was about 3 years ago; but once, as I was exhauſting the Receiver, it burſt, and cut my face, which deterr'd me from going on with it; tho' at this time I have a proper *Apparatus* to ſhew this experiment, which intirely deſtroys the doctrine of *Capſula's* or Caſes, by ſome aſſerted; as imagining that the Electricity does not paſs through the Body electrified; but it is very plain that it does; for otherwiſe it could never be convey'd into the exhauſted Glaſs Receiver.

EXP. XXXIV.

If you apply a common Loadſtone arm'd with iron, or one of Dr. *Knight*'s Artificial Magnets, to the gun-barrel when not electrified, by its attraction it adheres to the barrel; and to the end of the artificial one, a Key, &c. then electrify the gun-barrel, gun-barrel, and you will find the Electricity will not interfere with Magnetiſm. The Magnets, both real and artificial, becoming electrified, not only admit the Electrical fire, but attract and repel in all directions all light bodies by the power of Electricity; and at the ſame time the Electricity no-ways impedes the action of the Magnet.

Exp. XXXV.

At the beginning of this book, the reaſon that I gave why Glaſs ſhould have the power of attracting the Electricity was, that the chief compoſition of Glaſs was Fire or Sulphur; which made me conclude, that a Globe made of Sulphur only would ſerve to perform the electrical experiments as well as a Glaſs one: whereupon I made a Globe of Sulphur about 14 inches diameter, and found it anſwer exceeding well, and better than Glaſs. If a perſon holds all the fingers of one hand over the Sulphur-Globe, when excited, and even at three inches diſtance, there will be ſtreams of fire attracted from all the pores of the fingers; and as it ruſhes upon the globe, it makes ſuch a hiſſing noiſe, and gives ſo much light, that really it is enough to ſtartle the perſon that tries the expement.

I have only obſerved this difference as yet between the Glaſs and Sulphur Globes, that if the Point of a Sword or Wire, *&c.* is held by a perſon electrified by a Glaſs Globe nigh to a Non-electric, a bluiſh flame will iſſue from the point: but, if held by the Non-electric towards the Electrified perſon, then the point of the Sword or Wire becomes only illuminated; but juſt the reverſe, if the ſame experiment is tried with the Sulphur Globe, which cannot be excited to any height by hands, or leather cuſhion as the Glaſs Globe

is;

is; but may, by means of folded linen between the hands and globe, be excited to a very high degree.

A Candle being juſt blown out, and held between an Electrified and a Non-electric body, ſo that the electrical ſtroke might paſs through the ſnuff, it will light up the Candle.

N. B. I always ſucceeded in this experiment when I made uſe of the Sulphur Globe.

Our experiments do not ſucceed well in damp, foggy, or hazy weather; the Electrical fire being then ſo much employ'd in ſaturating and ſupporting the Atmoſphere, that we can attract but little Electricity from the Air; beſides the watry and earthly particles, which at thoſe times the Air is charged with, ſettle upon our ſilk lines and ſupporters, and by that means cauſe them to convey part of the Electrical fire into the earth, inſtead of repelling it.

When vapours, exhalations, *&c.* that are attracted into the Air, are driven by the winds in greater quantities than ordinary over that part of the habitable globe which we reſide on, then we ſay it is gathering for Rain. The reaſon of my ſaying, the watry and earthly particles are driven together by the winds, is, that when we ſee ſuch heavy clouds that ſeem ready to deliver their loads in kind and friendly ſhowers, and ſometimes in tempeſtuous ones, if a ſtrong wind ariſes, we find they are removed by the winds from over the threatened place to another, and there deſcend in rain. It is obſerved of thoſe days, when the Atmoſphere is fulleſt of matter, that the preſſure of the Air is leaſt.

I have obſerved, that the *effluvia* of the Earth being attracted into Air become electrified, and the particles of theſe *effluvia* repel each other; and when the electrical Æther, which is diſſeminated throughout the univerſe, becomes clogg'd by the *effluvia* of the Earth over any one part of this globe, it cannot act with ſo much vigour as it did before, the ſpring centrifugal, or repulſive force, being weaken'd. But when Æther is overcharg'd by the *effluvia* of the Earth, and no longer able to ſupport thoſe *effluvia* againſt the Earth's attraction, they then deſcend to the earth, to aſſiſt in the new generating and nouriſhment of Animals and Vegetables; and while they deſcend to the Earth in one part, they are attracted from the Earth in another, to keep up the round of Generation.

We have had an account of one cured of a Paralytic diſorder, by being electrified; and of a woman cured of an Apoplectic Fit, who was electrified and blooded.

One of my acquaintance, who had a violent Crick in his Neck, I electrified, and gave him a ſhock or two in the head, which immediately cur'd him.

Another that had been terribly troubled with the Night-Mare, or being hag-ridden, ſo that he had not ſlept for 7 or 8 nights, and at times, when he was likely to go to ſleep, he would ſtart from it, and be in all the agonies imaginable; but, upon his being electrified, and going through ſome of the ſhocks, he went home, and ſlept as well as ever. I have ſeen him ſeveral times ſince, and he informed me, that he has not had any return of it; but, if ever he ſhould, he would be electrified again.

The CASE *of* John Dew, *written by himſelf.*

May 26. 1747.

ABOUT nine months ſince I was playing at Billiards, and blew one of the balls out of my mouth for a conſiderable time, as nigh as I can judge about two hours. Afterwards, I was not very well all that day: and to my ſurprize, in about a week's time or leſs, I had a ſmall ſwelling on the right ſide of my Groin; which I did not take a great deal of notice of, till about three months afterwards I perceiv'd it to grow ſomewhat bigger, though with little or no pain; but, fearing bad conſequences might happen in time, I applied to a perſon of judgment, who told me it was a wind-rupture; upon which I bought a truſs, and applied it to the part affected. When I had worn it about two months, I found the wind began to fall into my *ſcrotum*, which at firſt was not very big; but finding it to increaſe more every day, even to a very large ſize, I began to be in a very great concern about it. When I was us'd to ſqueeze my *ſcrotum* with my hand, I could feel the wind come into my belly, which cauſed me to belch; but if it happen'd (as it ſometimes would) that I could not break wind, it would inſtantly fly into my head, and make me ſo giddy, that I have hardly been able to ſtand; ſometimes it would ſettle in my breaſt, or under my ribs, which occaſion'd great pain, and my *ſcrotum* uſed to be ſo fill'd with wind as to be painful in walking. I having heard of the ſurpriſing experiments in Electricity, had the curioſity to go to Mr. *Rackſtrow*'s in *Fleetſtreet*,

Fleetſtreet, on *Friday* the eighth inſtant, to ſee them perform'd; where I received but one ſhock, which had an emotion on my ſpirits all the ſame day; and at night, putting my hand down to my *ſcrotum*, to my ſurprize I found all the wind diſſipated from that part. I told a perſon belonging to Mr. *Rackſtrow* of the effect it had on me; he adviſed me to come again to be electrified; but, being obliged to go into the Country, the *Tueſday* following, I walked very nigh an hundred miles by *Friday*, when I return'd again to *London*; and the next day, which was the 18th inſtant, I went to Mr. *Rackſtrow* again, where I received the ſhock 4 times. This put me into a violent ſweat. Ever ſince, bleſſed be God, I have continued in a tolerable ſtate of health; and now at this writing the wind has quite left me. This I atteſt to be true.

J. D.

This perſon receiv'd the ſhock ſtanding upon the Chain that I hung to the bottom of the electrified phial of water, by approaching his knuckle to the Tube electrified, to make the circle good, and at that time the Electricity muſt paſs through one of his thighs, and poſſibly might affect the ailing part; the fluids where the Electricity paſſes through being put into a violent agitation, the particles being electrified repel each other with violence, and, conſequently, may not only break the bubbles of wind, but quite remove the cauſe; as I have found by experiments upon them that have been afflicted with the Gout, or Wind in their Stomach, who, upon their receiving the ſhock acroſs the breaſt, have been immediately cured.

It has been proved by experiments, both at home and abroad, that Electricity is not only Light, but that it flies with the ſame rapidity. Both antient and modern philoſophers agree, that æthereal Light or Fire is diſſeminated throughout the univerſe, that the particles of all bodies, and Air, are kept at a diſtance by it, that the particles of this Fire, being clogg'd by earthy and watry particles, become leſs active; but ſuch earthy and watry particles as cohere with Æther, more active; its attractive and repulſive force, with its great expanſion, *&c.* convince me, that Æther and our Electrical fire is one and the ſame thing; and farther induces me to believe it to be the very ſame which *Homberg* means by his Sulphur, and Sir *Iſaac Neweon* by his Acid; and that the ancient doctrine of elementary Fire will be re-eſtabliſhed.

I know I am pulling on myſelf the indignation of ſome; but I believe, if Sir *Iſaac Newton* was alive, to ſee the experiments we now make in Electricity, he would allow of Elementary Fire himſelf. In the account we had from Mr. *Le Monnier*, it appears that he had kept a bottle of water electrified 36 hours: I have kept one ſo ten hours. There is but little motion to create Fire in this experiment; and I cannot imagine that we can add one particle to pure Fire, or deſtroy one.

I have found out ſome experiments myſelf relative to the Planetary Syſtem; ſuch as the glaſs Ball which turns upon its Axis, and revolves at the ſame time, which in ſome meaſure imitates the Earth in its diurnal and annual motions. 2. A ſmall piece of Leaf-gold, which I ſuſpended to the edge of a Copper Plate, revolved round it like a Comet. 3. A Rabbit's Bladder, which, I ſuſpend, will keep turning upon its Axis like the Sun, or one of the fixed Planets. In ſhort, I find that all bodies in the ſtate of ſuſpenſion, have a tendency to revolve, and turn upon their Axes: which is enough to make us think that this Electrical Fire is the cauſe of the Planets being kept in their places to turn upon their Axes and revolve.

If this rude eſſay of an Unlearned Fellow ſhould give ſome hints to ſuch as are willing, and capable of writing upon this ſubject, and ſome amuſement to others, whoſe hands it may happen to fall into, I ſhall be well pleaſed: if not, I ſhall be heartily ſorry for the trouble I give my readers.

F I N I S.

B. RACKSTROW,

Figure maker and *Statuary*, at *Sir Iſaac Newton's Head* in *Fleetſtreet, London*,

TAKES off Faces from the Life, and forms them into Buſts to an exact Likeneſs, and with as little Trouble as ſitting to be ſhav'd: Makes all ſorts of Figures in Plaſter, with Ornaments for Doors and Chimney-pieces in the neateſt Manner, to repreſent either Marble-Stone or Terracotta.

N. B. He likewiſe makes and mends leaden Figures, Vaſes, *&c.* for Gardens and Fountains,

He alſo takes this Method to acquaint the Curious,

That he has begun to exhibit his Electrical Experiments, ſuch as the Chair of Beatification, which proves, beyond Contradiction, that Electricity paſſes through the Pores of all Bodies, with its ſetting Fire to Exhalations, Vapours, and all inflammatory Fluids; which aſſiſts in demonſtrating the Similarity of Electricity to Lightning and Thunder, with all the other moſt curious and extraordinary Experiments invented either abroad, or in this Kingdom; with his own Experiments relative to the Planetary Syſtem, and the Sun's illuminating the Earth. But he begs to be excuſed exhibiting to leſs than Three at a time; and, if requir'd (upon Notice given the Night before) the Experiments ſhall be perform'd by a Sulphur Globe, of about fourteen Inches Diameter, which acts better than Glaſs. Price One Shilling each Perſon.

N. B. The Reaſon of not uſing the Sulphur Globe in common is, becauſe it is much more liable to break than a glaſs one.

At the ſame Place may be had, juſt publiſhed, Price 6 d.

A Treatiſe on the Circulation of the Blood, and the Communication between the Mother and the Fœtus; with an Explanation of the Figure of an Anatomy, wherein the Circulation of the Blood is made viſible thro' glaſs Veins and Arteries, with the Action of the Heart and Lungs; as alſo the Courſe of the Blood from the Mother to the Child, and from the Child to the Mother; by which means any perſon, tho' unskill'd in the Knowledge of Anatomy, may, at one View, be acquainted with the Circulation of the Blood, and in what Manner it is performed in our living Bodies. Adorned with a Copper-Plate; wherein the Structure of the Heart is deſign'd, and the glaſs Veſſels exactly repreſented in their Order, as they are in the Figure, to which they are to be referr'd.

N. B. This Figure, and ſeveral other curious anatomical Preparations, with Variety of other Curioſities, are to be ſeen at *B. Rackſtrow*'s in *Fleetſtreet*, at One Shilling each.

To the Honourable the

MEMBERS of the *Academy* of *Sciences* at *Bourdeaux.*

Learned Sirs,

HAVING found, by an Advertiſement in one of our public Papers, your Deſire of knowing the different Opinions of People upon the Similarity of Electricity to Thunder and Lightning, I humbly offer my endeavours in the manner following.

Sir *Iſaac Newton* ſays, that there are always ſulphureous exhalations aſcending into the Air, when the Earth is dry; there they ferment with nitrous acids, and ſometimes take fire, and generate Thunder, Lightening, *&c.*

In ſhewing ſome experiments in Electricity, I once made uſe of a phial which before that time had oil of vitriol in it; I put water into it, and electrified it as uſual; I uſed it about a day and half; in which time no accident happen'd; and then, on a ſudden, as I was ſhewing the experiments, it exploded with great violence, and a loud report, and with a flaſh like Lightning; tho' at that time, and for a conſiderable time before, no one had touch'd any thing that was electrified. The bottom of the phial I found in a perpendicular, under the place where it had hung; the cork and wire remained hanging in their places; but all the other parts and the water were forcibly repell'd all over the room. The pieces of glaſs I found upon the Drawers, Table, and Chairs, that were in the room; and obſerving where my cloaths were wetted by the water, I found the colour diſcharged; which made me recollect there had been Vitriol in the phial.

When I conſider, that the compoſition, or contents of the bottle, was a good deal of water, with a very little Vitriol or Sulphur, which, with the Electrical fire accumulated therein, had cauſed this great exploſion; I imagined it not improbable, that Æther, meeting with the nitro-ſulphureous and watry particles in the Air might be the cauſe of Thunder and Lightning. I believe, that, by our diſcoveries in Electricity, we may account for ſeveral *phænomena*; ſuch as the Northern Light called *Aurora Borealis*, Exhalations, Ebbing and Flowing of the Tides, ſubterraneous Fires and Vulcano's, ſuch as *Ætna, Veſuvius*, *Hecla*, &c. Earthquakes, muſcular motion, and the Winds.

The effects of Thunder are ſo like thoſe of gunpowder fired, that Dr, *Wallis* thinks we need not ſcruple to aſcribe them to the ſame cauſe; the compoſition of gunpowder being Nitre and Sulphur; Charcoal only ſerving to keep the parts ſeparate, for the better kindling.

We may conceive, from what Sir *Iſaac Newton* aſſerts, that there is a convenient mixture of nitrous and ſulphureous particles in the Air; which being ſet on fire, there follow both noiſe and light, as in the phænomena of Thunder, *&c.* and will run in ſuch directions as the exhalations lead to, as is found in a train of gunpowder.

I ſhall now prove, that Electricity is capable of ſetting thoſe nitro-ſulphureous particles on fire, and am very certain no one can prove that they can be fired without the aſſiſtance of the Electrical Fire in the Air.

Electricity will not ſet fire to bodies that are fixt, but to ſuch as are in a volatile ſtate, as all inflammatory fluids are; and a Candle juſt blown out being held between a non-electric and an electrified body, ſo that the electrical Stroke may paſs through the ſnuff, the Candle will be thereby re-lighted.

Mr. *Watſon* made an experiment with File-Duſt and Vitriol mixt with Water in a bottle, which cauſed an ebullition and heat; and if a perſon electrified holds his finger to the mouth of the bottle, the exhalation or vapour that ariſes takes fire and explodes (and would burſt the bottle, were it not to have a wide mouth) and ſo burns like a vulcano. I am well aware it may be objected that ſuch or the like compoſitions will take fire of themſelves. My anſwer is, I have tried ſeveral times the compoſition here ſpoken of, but never found that it did take fire of itſelf; tho' it never failed taking fire upon the approach of an electrified body; even of Water, when electrified, and ſuffer'd to run into it: but if any ſuch ſhould take fire of itſelf, can any one aſſert that it would do ſo, without the aſſiſtance of the Electrical Fire in the Air?

The followidg experiment will prove in a ſtronger manner the firing of ſulphureous exhalations by Electricity, which was told me by Mr. *John Pinchbeck*, *viz.* that at *White-haven* in the County of *Cumberland*, the ſulphureous exhalations ariſing from a Coal-mine, and confined to paſs through a tube, being ſet on fire, ſerve as a Light-Houſe; and it is a generally received opinion, that it would be fatal to that mine to carry a lighted candle into it; but the practice there is to make uſe of ſteel, formed like a grind-ſtone, being ſwiftly turn'd upon its axis, and, at the ſame time, a piece of flint applied thereto cauſeth ſuch a number of ſparks to fly off, as to afford the miners ſufficient light to work by, thoſe ſparks not being capable of ſetting fire to the exhalations, *&c.* as Electrical or other flames would do.

One of *Cohorn*'s grenades I filled with pit-coal broken ſmall, and fixed to it a ſmall gun-barrel, and at the other end of the barrel a ſmall pipe (a tobacco-pipe will do) and to the end of the pipe tied a bladder; having taken care that all the junctures were well luted, that when the Cohorn was ſet on the fire, the ſulphureous exhalation might paſs through the tubes, and fill the bladder: I then took the ſmall pipe and bladder from the barrel, and ſtopped the end with wax; and, when minded to try the experiment, I took away the ſtopper, and as the exhalation iſſued from the end of the pipe, applied it to a body electrified, and it took fire from the electrical ſtroke, and burnt like a candle, but, upon ſtopping it, it went out, and ſerved me for the ſame experiment ſeveral times.

It is ſaid, that at *Flaſhlun* in *Sweden*, noted for copper mines, the mineral exhalations affect the air ſo ſenſibly, that their ſilver coins are frequently diſcolour'd in their purſes, and the ſame effluvia change the colour of braſs.

Mr. *Boyle* was aſſured, by a gentleman who poſſeſs'd ſome ground wherein were ſeveral veins of metals and other minerals, that he had frequently ſeen pillars of fume aſcending thence; that in *Carniola*, *Campania*, &c. where there are mines of Sulphur, the Air at certain times becomes very unwholſome; that mines near the *Cape of Good Hope* emit ſuch horrible fumes from the Arſenick in them, that no animal can live near them, and that ſuch as were at any time opened, were obliged to be immediately cloſed again. From whence it is evident, that at all times there are immenſe quantities of exhalations, vapours, *&c.* attracted from the earth into the Air; where, becoming ſaturated with electrical Æther, thoſe particles acquire that centrifugal force which Sir *Iſaac Newton* attributes to Air.

If you cut ſome Gold or Silver Thread, Tinſel, or very fine Wire, into pieces of about half an inch long, and hold them on a ſalver under a metal Plate electrified, they will be attracted up; but, meeting with the body electrified, a number of ſmall exploſions will be created, and they become electrified, and with greater force repell'd than when attracted up to the electrified plate; and, undoubtedly, if the motion of thoſe pieces of Wire, *&c.* was not ſo quick, but would give time, ſo that, by the application of one's hand, we might feel the electrical blaſt, as we do from the points of penknives, needles, *&c.* we ſhould ſee the ſame bluiſh flame as from them.

The exhalations of all ſuch Non-electrics as Metal, being attracted into Air, and there meeting with ſuch ſort of exhalations as themſelves (already ſaturated with electrical Æther) cauſe ſuch innumerable ſmall exploſions, that the part of the heavens where they are ſeems to ſhiver and ſhew thoſe ſtreams of flaſhing Lights which are called *Auroræ Boreales* or the Northern Lights; the North abounding with metallic Mines, *&c.* more than any of the other parts of the globe. In the ſame manner Thunder and Lightening may happen, when the exhalations are in greater quantities, and more denſe.

Let us ſuppoſe a column of mineral exhalations, or aqueous vapour, aſcending into Air by the ſun's attraction and ſubterranean heat, aſſiſted by the æthereal or electrical Fire, which is ever reſtleſs, and pervading the pores of all bodies, and this I conceive to be the Spirit of the Air, which aſſiſts in the production of all things, according to the *Matrix* or different pores of Earth it uſes to meet with; for, having the quality of attracting from the Earth the effluvia of each conſtituent part thereof, it gives to them fluidity, and conveys them along with it; and as it paſſes through the pores of terreſtrial bodies that have loſt their volatile part, theſe bodies will attract to themſelves each their proper effluvia, and fix them; which has been obſerv'd in a great many different bodies, and particularly in different Salts, which having had their Spirits diſtill'd from them, and they expoſed to the air, have in a ſhort time conſiderably increaſed in their weight, and freſh Spirits drawn from them, and ſo for 8 or 9 times ſucceſſively.

But as to the exhalations, *&c.* aſcending into Air (from which I have digreſs'd) they meeting with a Cloud ſaturated with electrical Æther, which Cloud aſſiſts in attracting the effluvia towards it, as light bodies are attracted by a body electrified; and, though brought by the electrical

Fire in the Air towards that body, are not filled therewith, until they touch the body electrified, and then are immediately repell'd, the effluvia aſcending to meet the electrified Cloud in a fainter manner attract the Cloud; but, when they meet, the attractive force ceaſeth, and then the repulſive power begins; which cauſeth that flaſh of Lightning, and conſequential noiſe of Thunder; the Cloud, acting ſtronger than the Effluvia, darts its electrical or æthereal Fire through the exhalations, *&c.* to replete them therewith. But if theſe exhalations, *&c.* upon their approach to the ſaturated Cloud, ſhould likewiſe reach the Earth, then, conſequently, the Lightning would dart to the Earth, and might deſtroy whatever Animals, Vegetables, *&c.* ſhould happen in its way.

I ſhall now endeavour further to ſhew the Similarity of Thunder and Lightning to Electricity. The ſurpriſingly violent ſhock that is to be given (even in a degree greater than they can well bear) to any number of perſons at once, is ſufficient to ſatisfy us, that the Electricity, paſſing through a Tree in the ſame manner, muſt ſhock the Fluids thereof as it does the animal body. If we could collect a great deal more Electricity, we might ſplit the Tree, as we burſt the veſſels in Animals kill'd by Electricity, whoſe bodies look livid, as when kill'd by Lightening.

Mr. *Watſon* communicated the following experiment to me, and ſhew'd me ſuch a large Glaſs as I am about to deſcribe; but his was broke. He took the hint from Dr. *Bevis*, who, for the ſame experiment, made uſe of a flat Glaſs gilt on both ſides, excepting a margin round (no matter what form). This Glaſs that was ſhewn me was blown very thin, in the ſhape of a cylinder like a confectioner's, and open at top, and gilt both on the inſide and outſide to within two inches of the top. I cover'd mine (which was about twenty inches high, and ten diameter) with gilt leather, as high as it was gilt; which preſerv'd it from breaking, and made it act the ſtronger. The metal within ſuch a Glaſs as I have deſcribed, when electrified, will act with greater vigour more than 25000 times its own weight of iron File-duſt in bottles electrified; which proves that it is from the number of the points in contact that it comes to act ſo ſtrongly, and not from the quantity of the metal. I let a piece of Chain hang down from the tube which I had electrified, to electrify the metal within the Glaſs; I made uſe of another piece of Chain, about ten yards long, one end of which I laid under the bottom of the Glaſs, and the other end I held to the tube electrified, to cauſe the exploſion, which was as loud as the report of a Piſtol, and the flaſh of light ſo very bright as to dazzle the eyes of the beholders; the whole Chain that led the electrical exploſion was not only illuminated, but darted Fire in moſt directions; the report, though as loud as that of a Piſtol, was not ſo ſhort, but more like that of Thunder. The firſt time I tried this experiment, I thought it had broken the Glaſs to pieces. In places where the Chain communicated, I have in a proper manner, in one place, put warm Spirits of Wine, in another File-duſt, Vitriol, and Water mixt together, ſome Oil of Turpentine in a third, and in trying the above experiment, all theſe different things would take fire together; which is a proof, that Electricity is capable of ſetting fire to all ſulphureous Exhalations or Vapours in the Air; and thoſe combuſtible Clouds taking fire one after the other, their different exploſions cauſe the ſucceſſive noiſe of Thunder.

I muſt here obſerve, that Water is as great a conveyer of Electricity as Metal, and conſequently may, in the producing of Thunder, have the ſame effects. Such experiments have been tried by the ſides of and acroſs great rivers, and the Water has been found to convey the Electricity for ſeveral miles together as well as the Iron Chain, the perſons trying the experiment receiving as violent a ſhock.

To give my opinion in what manner that kind of Thunder, *&c.* is generated, which proves the moſt deſtructive.

I firſt ſuppoſe a Cloud form'd principally from Mineral Exhalations, or from Vapours aſcending from Waters, and that it is become ſaturated with electrical Æther; wherefore, the better to convey my meaning, I term it an Electrified Cloud, it being a non-electric become electrified (as my electrified tin tube, and the chain hanging from it into the glaſs to electrify the metal therein); and at one end of this Cloud, between it and the earth, a ſulphureous one annexed, which I call an electrical Cloud; Sulphur being an originally-electric; the particles of Sulphur not ſuffering the Electricity to paſs through (but all light bodies, whether electrical or not, will be attracted into Air): wherefore theſe electrical Clouds act in the Air as the cylindrical glaſſes do in our experiments, preventing the body electrified and the non-electric from touching. Secondly, let us ſuppoſe a high hill, whoſe bowels abound with metallic Veins, *&c.* and Water continually running down from thence into a river at the foot thereof; and that Vapours are aſcending from that river, and approach to one end of ſuch an electrified Cloud as is before deſcribed: let us ſuppoſe alſo, that the end, where the ſulphureous Cloud intercepts, hinders the Vapours of the Water from touching the electrified Cloud; in that caſe ſuch an intervention will conſequently prevent the exploſion thereof. In the ſame manner the cylindrical Glaſs acts, by preventing the Electricity from paſſing through the bottom thereof into the Chain laid under it: and we may reaſonably allow, that, at the ſame time that the Vapours are ariſing from the Waters, the Exhalations may be attracted from the Metals, *&c.* and are aſcending into Air from the top of the mountain, and very probably from the river even to the top of the hill, either from the Water running down the hill, or from the veins of Metal therein, Exhalations, *&c.* may be gliding up the hill, in order to join the Exhalations aſcending from the top thereof, which would carry on the communication between the bottom of the Vapours ariſing from the river, and the Exhalations ariſing from the top of the mountain: but if there was no Exhalation, *&c.* ariſing from the declining part of the hill, the veins of Metal, *&c.* in the earth, or the Water running down the hill, would make the communication good; even dry Land would convey it, but not with ſo much ſtrength.

It has been found by experiments, that the large quantities of Water in rivers no-ways hinder the circle from being made good; for Electricity will always paſs the nigheſt way. The Exhalations, *&c.* aſcending from the top of the hill, and approaching that end of the electrified Cloud, where there is no ſulphureous Cloud to prevent their touching, cauſes that dreadful exploſion called Lightning and Thunder, with all its terrible effects.

The Chain that has one end under the cylindrical Glaſs, having the other end applied to the Tube electrified, acts as the Exhalation, *&c.* aſcending from the hill and water; the upper Cloud ſaturated with electrical Æther (as before obſerved) acting as our Tube electrified, and being diſturb'd at its end by the approach of the Exhalation, *&c.* as our electrified Tube is at the approach of the end of the Chain; for when the attractive force ceaſeth, the repelling power begins, and, of conſequence, muſt act ſtronger from the ſaturated Cloud, than from the effluvia of the earth aſcending to it; ſo darts the electrical Æther from both ends of the Cloud vehemently (in order to keep up the æquilibrium) into the Exhalations and Vapours which ariſe from the Mountain and River. For I ſuppoſe the ſulphureous Cloud no longer capable of preventing the Electricity from breaking through (when it exerts itſelf) than our Glaſs in the experiment where the ſhock is given; this æthereal Fire being led in whatſoever direction thoſe Exhalations, *&c.* are in, may conſequently paſs through Trees or Animals, *&c.* they all being great conveyers of this electrical Æther. This Fire, in its progreſſion through the effluvia, electrifies (if the expreſſion be allow'd) each particle thereof; which cauſeth thoſe particles to fly aſunder, and become Air: but eſpecially the hardeſt of the effluvia; for Sir *Iſaac Newton* takes true and permanent Air to be form'd from the Exhalations raiſed from the hardeſt and moſt compact bodies. And as this æthereal Fire is darted from the electrified Cloud at one end, it paſſes through the Exhalations, &c. raiſed from the top of the hill, and ſo downwards; and from the other end of the Cloud through the Vapours attracted from the water, and ſo up the hill, in order to ſaturate all the effluvia with electrical Æther, whoſe particles, meeting in different directions, repel each other; whereby the particles of the effluvia are made to fly aſunder with ſuch aſtoniſhing violence, as to rend rocks and trees, burſt the veſſels of animals, &c.

Metals, and ſome Minerals (which are great conveyers of Electricity) being generally found in Hills more than elſewhere, I have choſen to ſuppoſe a high hill in the foregoing pages on that account; and from an apprehenſion, that what I have there ſaid may thereby be more eaſily underſtood; for the ſame effects may be produced on level ground.

As to other effects of Electricity ſimilar to thoſe of Thunder and Lightning;

1. The electrical ſtroke is always ſtrongeſt where it finds the greateſt reſiſtance, and which is always according to the denſity of the body acted upon. The ſtrong texture of the bones, nerves, and blood-veſſels, making the greateſt reſiſtance, ſuffer the moſt; but it paſſes more eaſily through the pores of the Fleſh. In like manner, Thunder and Lightning will deſtroy the Bones, and burſt the Veſſels of animals, without doing any manifeſt hurt to their Fleſh.

2. When any number of perſons join hands, in order to receive the electrical ſhock, if a ſtander-by puts his hand upon the ſhoulder, &c. of any one of

ſuch perſons when the experiment is tried, it will not have any effect upon ſuch a ſtander-by; the electrical Fire always taking the nigheſt way: and, from conſidering the experiment of the large cylindrical Glaſs, and what more has been ſaid to that purport, it ſeems probable Thunder and Lightning may happen without any ſulphureous matter being ſet on fire, even ſo as to have the power to deſtroy Houſes, Trees, Animals, *&c.* as before obſerv'd; and being led in the direction of the Exhalation, *&c.* where two men are, kill one, and ſpare the other, though they ſhould even touch each other.

3. Electricity will ſet fire to all inflammatory Exhalations or Vapours (as before obſerv'd), aud they to whatever is combuſtible; and no doubt but there is always ſtore of ſulphureous Exhalations and inflammatory Vapours in the Air, that may take fire at theſe grand exploſions of Lightning and Thunder, which I have been treating of; therefore may ſet fire to Houſes, Trees, Stacks of Hay, Corn, *&c.* or even melt Metals. The electrical Æther abounding with the ſubtil parts of terreſtrial ſalts, when led through any matter wherein Metals are contained, may, at the time of Lightning, *&c.* convey the moſt powerful of thoſe ſalts into the pores of ſuch Metal, as it paſſes through them. And this conſidered ſeems to account for that ſurpriſing effect of Lightning that has deſtroy'd a Sword, without hurting the Scabbard that contain'd it. And not unlike to this, in its effects, is *Aqua fortis* (which is drawn from ſome of the before-mention'd ſalts), which ſpares ſoft bodies, and deſtroys hard ones.

With me there remains no doubt, that farther proof of the ſimilitude of Electricity to Lightning,

&c.

&c. will be often obtained and, clearly manifeſted from future experiments: and if I ſhall have the good fortune to have made out ſatisfactorily what I am firmly perſuaded is true, *viz.* that Lightning and Electricity are the ſame Fire, or to have furniſhed out hints for others of greater abilities to improve upon, I ſhall have gained my whole aim, and ſit down well pleaſed with my labour; having the honour to ſubſcribe myſelf,

Gentlemen,

Fleetſtreet, London,
Dec. 6. *O. S.*
1748.

Your moſt devoted

Humble Servant,

B. Rackſtrow.